Montana Fish, Wildlife & Parks

2300 Lake Elmo Drive
Billings, MT 59105

July 12, 2010

TO: Environmental Quality Council
Director's Office, Dept. of Environmental Quality
Montana Fish, Wildlife & Parks*

| | |
|---|---|
| Director's Office | Lands Section |
| Parks Division | Design & Construction |
| Fisheries Division | Legal Unit |
| Wildlife Division | Regional Supervisors |

Mike Volesky, Governor's Office *
Sarah Elliott, Press Agent, Governor's Office*
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Montana Historical Society, State Preservation Office
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Montana Wildlife Federation
Montana State Library
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Montana Environmental Information Center
Wayne Hirst, Montana State Parks Foundation
FWP Commissioner Shane Colton*
Montana Parks Association/Our Montana (land acquisition projects)
Richard Moore, DNRC Area Manager, Southern Land Office
County Commissioners
Other Local Interested People or Groups
* (Sent electronically)

Ladies and Gentlemen:

A draft environmental assessment (EA) has been prepared to assess the potential impacts of a barrier construction, piscicide treatment, and restocking on the physical and human environment to protect Lower Deer Creek's Yellowstone cutthroat trout population. Lower Deer Creek is a tributary of the Yellowstone River that supports a nonhybridized population of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). Fish, Wildlife and Parks (FWP) biologists found several Yellowstone cutthroat trout x rainbow trout (*Oncorhynchus mykiss*) hybrids. The presence of hybridized fish puts the genetic integrity of the pure population at extreme risk, and obligates FWP to intervene to protect this core population of Yellowstone cutthroat trout. Proposed actions include constructing a barrier to prevent upstream movement of fish into the protected habitat. In addition, the waters above the barrier would be treated with rotenone to remove nonnative brown trout (*Salmo trutta*) and hybrids.

A 30-day public comment period will extend from July 15, 2010 to August 13, 2010. A public meeting will be held at the Carnegie Public Library in Big Timber, Montana (314 McLeod Street) on August 4, 2010 at 6:00. Interested parties should send comments to: Jeremiah Wood Montana Fish, Wildlife & Parks P.O. Box 27, Fishtail, MT 59028 or email jrwood@mt.gov.

Thank you for your interest,

Gary Hammond
Region 5 Supervisor

Enclosure

# LOWER DEER CREEK YELLOWSTONE CUTTHROAT CONSERVATION PROJECT

**Draft Environmental Assessment**

**July 15, 2010**

**Montana Fish, Wildlife & Parks**

**Region 5 Office**

**2300 Lake Elmo Drive**

**Billings, Montana 59105**

# Table of Contents

## List of Figures

## List of Tables



## List of Abbreviations

| | |
|---|---|
| BMP | Best management practice |
| DEQ | Montana Department of Environmental Quality |
| DNRC | Department of Natural Resources and Conservation |
| EA | Environmental Assessment |
| EPA | US Environmental Protection Agency |
| FWP | Montana Fish, Wildlife & Parks |
| GNF | Gallatin National Forest |
| Hybrids | Rainbow trout x Yellowstone cutthroat trout hybrids |
| Hybrids | Yellowstone cutthroat trout x rainbow trout hybrids |
| $KMnO_4$ | Potassium permanganate |
| MCA | Montana Code Annotated |
| MEPA | Montana Environmental Policy Act |
| MNHP | Montana Natural Heritage Program |
| MOU | Memorandum of understanding |
| MSDS | Material data safety sheet |
| RBT | Rainbow trout |
| SPA | Stream Protection Act |
| USFWS | US Fish and Wildlife Service |
| YCT | Yellowstone cutthroat trout |

## Executive Summary

Lower Deer Creek is a tributary of the Yellowstone River that supports a nonhybridized population of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). In 2005, Montana Fish, Wildlife & Parks (FWP) biologists found several Yellowstone cutthroat trout x rainbow trout (*Oncorhynchus mykiss*) hybrids. The presence of hybridized fish puts the genetic integrity of the pure population at extreme risk, and obligates FWP to intervene to protect this core population of Yellowstone cutthroat trout. Proposed actions to protect Lower Deer Creek's Yellowstone cutthroat trout population include constructing a barrier to prevent upstream movement of fish into the protected habitat. In addition, the waters above the barrier would be treated with rotenone to remove nonnative brown trout (*Salmo trutta*) and hybrids. Yellowstone cutthroat trout captured before treatment would be returned to Lower Deer Creek following chemical removal of fish. If mottled sculpin (*Cottus bairdi*) are present in the project area, this species would also be reintroduced to reclaimed waters.

This document is an environmental assessment (EA) of the potential impacts of the barrier construction, piscicide treatment, and restocking on the physical and human environment. EAs are a requirement of the Montana Environmental Policy Act (MEPA). This act requires state agencies to consider the environmental, social, cultural, and economic impacts of proposed activities.

Evaluation of the impacts of barrier construction, piscicide treatment, and restocking of Yellowstone cutthroat trout found this project would have minor, temporary impacts on the environment and social considerations, and no effects on cultural or economic considerations. The most significant effect would be elimination of nonnative brown trout and hybrids, short term and minor impacts to aquatic invertebrates, and restoration of the native fishery. Angling opportunities could be reduced until the Yellowstone cutthroat trout population rebounded.

MEPA also requires public involvement and opportunity for the public to comment on projects undertaken by state agencies. A 30-day public comment period will extend from July 15 2010 to August 13, 2010. A public meeting will be held at the Carnegie Public Library in Big Timber, Montana (314 McLeod Street) on August 4, 2010 at 6:00. Interested parties should send comments to:

Jeremiah Wood
Montana Fish, Wildlife & Parks
P.O. Box 27
Fishtail, MT 59028
(406) 328-4594
jrwood@mt.gov

# 1.0 PROPOSED ACTION DESCRIPTION

## *1.1 Type of Proposed Action*

This proposed action is a native fish conservation project aimed at securing an imperiled population of pure Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) in Lower Deer Creek, a tributary of the Yellowstone River downstream of Big Timber, Montana.

## *1.2 Agency Authority for Proposed Action*

**Montana Code Annotated (MCA) 87-1-702. Powers of department relating to fish restoration and management**. The department is hereby authorized to perform such acts as may be necessary to the establishment and conduct of fish restoration and management projects as defined and authorized by the act of congress, provided every project initiated under the provisions of the act shall be under the supervision of the department, and no laws or rules or regulations shall be passed, made, or established relating to said fish restoration and management projects except they be in conformity with the laws of the state of Montana or rules promulgated by the department, and the title to all lands acquired or projects created from lands purchased or acquired by deed or gift shall vest in, be, there remain in the state of Montana and shall be operated and maintained by it in accordance with the laws of the state of Montana. The department shall have no power to accept benefits unless the fish restoration and management projects created or established shall wholly and permanently belong to the state of Montana, except as hereinafter provided.

## *1.3 Estimated Commencement Date and Schedule*

This would be a three-phase project involving barrier construction, followed by rotenone treatment of waters above the barrier, and reintroduction of Yellowstone cutthroat trout to treated waters. Reintroduction of mottled sculpin would also occur if this species is found within the project area. Barrier construction is slated for late summer of 2010, and will take about one month. Piscicide treatment would follow in September 2011. This would entail two consecutive treatments with rotenone in a 1-week period. A third treatment may be necessary in 2012 or 2013, if previous treatments are unsuccessful. Yellowstone cutthroat trout would be reintroduced to the stream several days after the final piscicide treatment. Electrofishing surveys would evaluate the presence of mottled sculpin upstream of the barrier. If present, this species would also be returned to the waters upstream of the barrier.

## *1.4 Name and Location of Project*

**Lower Deer Creek Yellowstone Cutthroat Trout Conservation Project**. Lower Deer Creek is a tributary of the Yellowstone River in Sweet Grass County, Montana (Figure 1-1). The project would occur in the upper reaches of Lower Deer Creek, beginning within the state section located 1 mile south of the US Forest Service boundary. A fish barrier would be constructed near the southwest corner of this section. Fish-bearing portions of streams upstream of the barrier would be treated with rotenone to reclaim these waters for native Yellowstone cutthroat trout. Treatment would extend upstream to a waterfall within the Gallatin National Forest that serves as a natural fish barrier. The lower miles of two tributaries, Placer Gulch and West Fork Lower Deer Creek would also be treated with piscicide. The detoxification reach would begin downstream of the constructed barrier, and would extend 30 minutes travel time, which would equate to about 0.5 miles of stream length

## *1.5 Project Size (Acres Affected)*

| | | Acres/miles | | | Acres |
|---|---|---|---|---|---|
| (a) | Developed | 0 | (d) | Floodplain | < 0.01 |
| | Residential | 0 | | | |
| | Industrial | 0 | (e) | Productive | 0 |
| | | | | Irrigated cropland | 0 |
| (b) | Open space/woodlands/recreation | 0 | | Dry cropland | 0 |
| | | | | Forestry | 0 |
| | | | | Rangeland | 0 |
| (c) | Wetlands/riparian areas | 11 miles | | Other | 0 |

## *1.6 Name and Address of Project Sponsor*

Jeremiah Wood
Montana Fish, Wildlife & Parks
P.O. Box 27
Fishtail, MT 59028
(406) 328-4594
jrwood@mt.gov

## *1.7 Project Map*

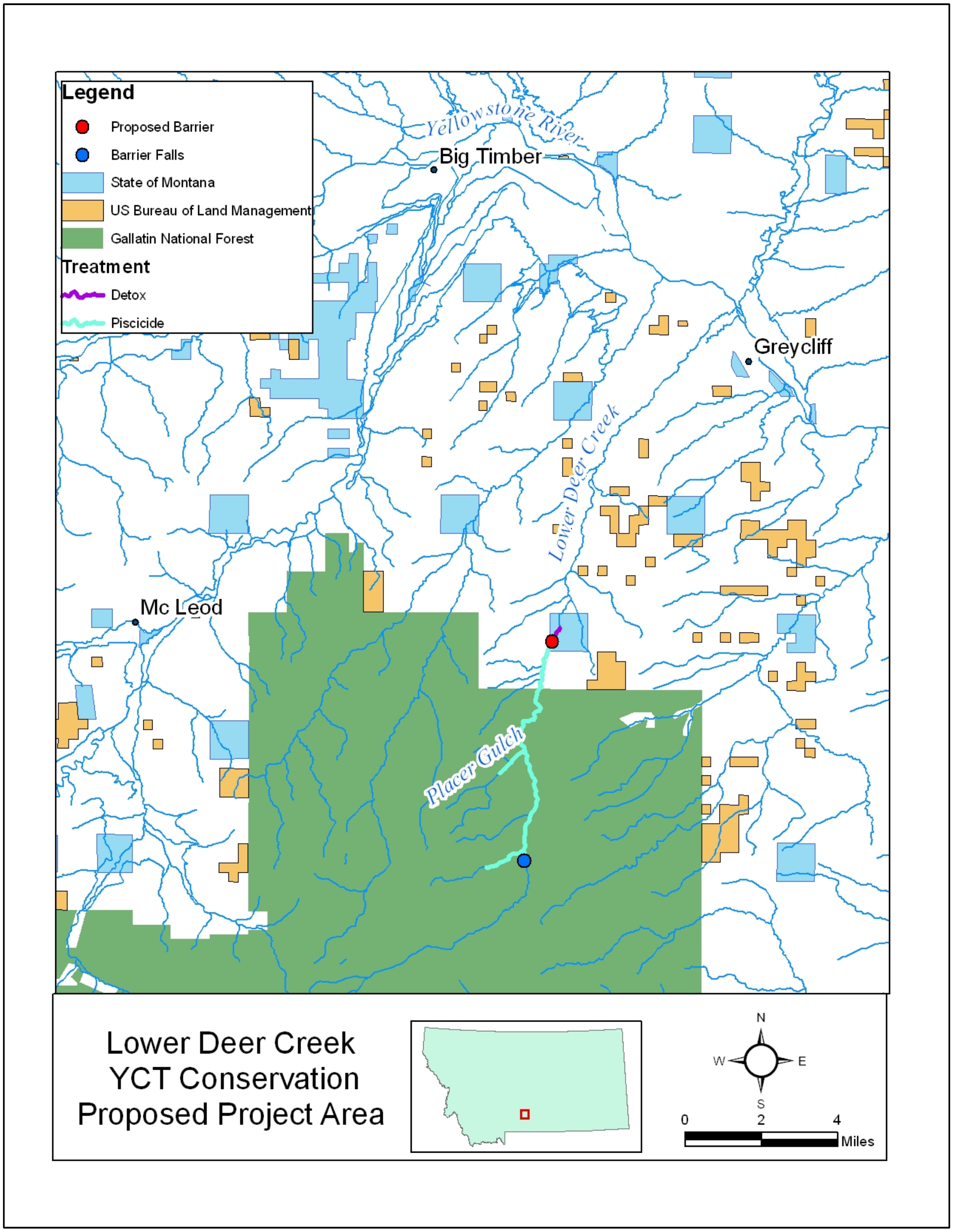


**Figure 1-1: Overview of Lower Deer Creek.**

## *1.8 Narrative Summary of the Proposed Action and Purpose of the Proposed Action*

### 1.8.1 Status of Yellowstone Cutthroat Trout

This proposed action is a native fish conservation project aimed at securing a highly imperiled population of Yellowstone cutthroat trout in Lower Deer Creek, a tributary of the Yellowstone River near Big Timber, Montana (Figure 1-1). The Yellowstone cutthroat trout is native to Montana and several neighboring states: Wyoming, Idaho, Utah, and Nevada. In Montana, Yellowstone cutthroat trout historically occupied streams and lakes in the Yellowstone River watershed having suitable habitat, water quality, and thermal regime. Like many native cutthroat trout, Yellowstone cutthroat trout have experienced dramatic declines in abundance and range. Yellowstone cutthroat trout currently occupy an estimated 43% of their historic multi-state range (Figure 1-2; May et al. 2007). In Montana, this subspecies occurs in only 34% of the historic range, with pure Yellowstone cutthroat trout confirmed in 35% of the remaining habitat (FWP fisheries database). Another 13% of its currently occupied habitat potentially supports unhybridized fish; however, genetic testing is necessary to verify the genetic status of these populations.

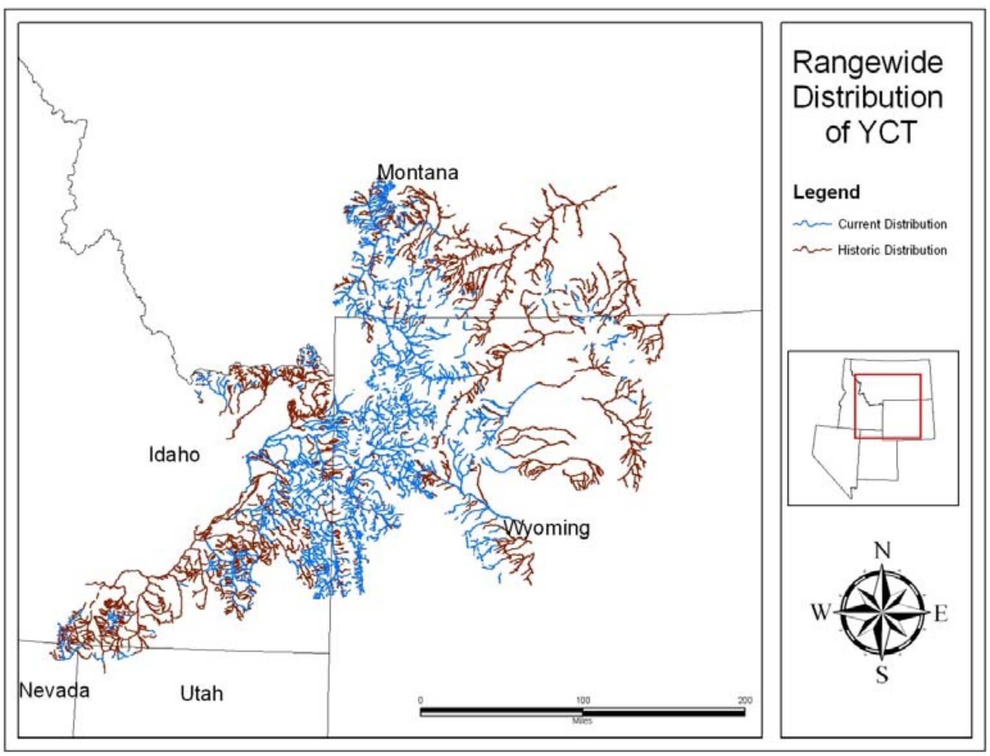


**Figure 1-2: Historic and current distribution of Yellowstone cutthroat trout across its native range (FWP fisheries database).**

The diminished and fragmented distribution of Yellowstone cutthroat trout is the result of a variety of disturbances across the landscape. Introduction of nonnative salmonids (rainbow trout, brown trout, and brook trout) has been especially harmful (Gresswell 1995; Kruse et al. 2000). Hybridization with rainbow trout is a leading and irreversible cause of the decline (Kruse and Hubert 2002), and the resulting fertile offspring form hybrid swarms (Allendorf and Leary 1988). Brook trout and brown trout compete with Yellowstone cutthroat trout, and can eventually displace this native species. Brown trout consume fish as a substantial component of their diet, making predation another threat to native cutthroat trout.

Habitat degradation and other alterations have also contributed to the decline in native cutthroat trout. Land use activities that degrade riparian health and function, and contribute to stream bank erosion and channel instability, can limit the suitability of the habitat, and impair water quality. Features such as road crossings and irrigation diversions have potential to restrict movement of fish, which can eliminate access to spawning, rearing, or overwintering habitat. Irrigation withdrawals have had profound effect on some Yellowstone cutthroat trout populations, as water demand coincides with sensitive incubation periods for Yellowstone cutthroat trout eggs, and can result in significantly reduced habitat availability and warm water temperatures. A notable feature of the project area is that many of these disturbances are absent or minimal in the project area, which gives the Yellowstone cutthroat trout a high probability of persisting with removal of nonnative trout.

Marked reductions in distribution and abundance of Yellowstone cutthroat trout in their historic range has resulted in their designation as a species of special concern (MNHP and FWP 2006). In response to these declines and designated status, a diverse group of state and federal agencies, agricultural and silvicultural interests, and environmental advocacy groups developed a memorandum of understanding (MOU) to guide conservation, protection, and restoration of cutthroat trout in Montana (Montana Cutthroat Trout Steering Committee [MCTSC] 2007). This MOU placed protection of pure populations of cutthroat trout as the highest priority in cutthroat trout conservation in Montana. This priority has specific relevance to Lower Deer Creek, as recent invasion of rainbow trout x Yellowstone cutthroat trout hybrids (hybrids) is placing the pure population at grave risk. Therefore, this project is consistent with the highest priority for cutthroat trout conservation in Montana, and reduces justification for listing Yellowstone cutthroat trout as threatened or endangered.

Concerns over the status of Yellowstone cutthroat trout have prompted environmental advocacy groups to petition the US Fish and Wildlife Service (USFWS) to list this subspecies as a threatened or endangered species. In two decisions, the USFWS found listing Yellowstone cutthroat trout to be unwarranted, citing the presence of stable, viable, and self-sustaining populations throughout its historic range as justification for this determination (USFWS 2001, 2006). Nonetheless, plaintiffs submitted a notice of intent to sue in 2006, indicating legal challenges are likely. In the interim, FWP and its conservation partners are implementing projects, such as this proposed action, to decrease the justification for including Yellowstone cutthroat trout on the endangered species list.

### 1.8.2 Background on Lower Deer Creek

Lower Deer Creek originates in the Gallatin National Forest, on the north flank of the Beartooth Mountains, and flows for 27 miles until its confluence with the Yellowstone River (Figure 1-1). This stream supports pure Yellowstone cutthroat trout along much of its length, in addition to a sympatric population of nonnative brown trout (Olsen 2007). Only Yellowstone cutthroat trout, hybrids, and brown trout have been found within the US National Forest, although mottled sculpin may also be present. Although rare near the mouth, the proportion of Yellowstone cutthroat trout increases proceeding upstream and onto the Gallatin National Forest. Approximately 4 miles downstream of the forest boundary, the mix of brown trout to Yellowstone cutthroat trout is 5:1. Within the Gallatin National Forest, Yellowstone cutthroat trout increase in their relative abundance, and the proportion of brown trout to Yellowstone cutthroat trout is closer to 2:1. Fish were historically absent from the portion of Lower Deer Creek above a series of waterfalls (Figure 1-3). Efforts to stock this reach with Yellowstone cutthroat trout in the 1980s and in 2002 failed to establish a self-sustaining population; however, embryo introductions beginning in 2009, which used artificial redds, may prove to be successful.

**Figure 1-3: The first of two barrier waterfalls on Lower Deer Creek.**

Information on fishing pressure in Lower Deer Creek is limited, with angling data available for only 1999 and 2007 (MFISH database). In both years, resident anglers accounted for all the fishing pressure on Lower Deer Creek. Fishing pressure was low in 1999, with an estimated 34 angling days, which gave Lower Deer Creek a ranking of 1713 for the state, and 202 for the region. In contrast, considerably greater angling pressure occurred in 2007, with an estimated 226 angling days, giving the stream a state ranking of 558 and regional ranking of 79.

Although fishing pressure is relatively light for Lower Deer Creek, individual anglers greatly value this resource. Several local landowners have expressed their enthusiasm for fishing in this beautiful setting, and visitors to the Gallatin National Forest likely value the recreational opportunities as well. During scoping for previous phases of Yellowstone cutthroat trout conservation in the watershed, some local anglers expressed concerns regarding the potential for cutthroat trout conservation to eliminate the ability to harvest fish from the project area. Current

FWP fishing regulations allow for the harvest of Yellowstone cutthroat trout in Lower Deer Creek as part of the daily bag limit. No changes to these regulations are being proposed.

Until recently, the Yellowstone cutthroat trout population in Lower Deer Creek has been free of hybridization. The earliest genetic investigations occurred in 1989 and 1990, and these studies found only unhybridized fish in Lower Deer Creek and Placer Gulch (Figure 1-1 and Table 1-1). In 2005, hybrids were found below the US Forest Service boundary (Leary 2006). Genetic analyses indicated the eight hybridized fish were first generation backcrosses to Yellowstone cutthroat trout, meaning one parent was a first generation hybrid, and the other a pure Yellowstone cutthroat trout. Such pairings are typical of the early stages of hybridization, and indicate the need for immediate action to prevent further spread of hybridized fish. Although samples collected within the forest in 2006 found only unhybridized Yellowstone cutthroat trout, a hybrid was captured near Placer Gulch in 2008 (Leary 2008), verifying concerns over the potential for hybrids to invade upstream and threaten the pure population. In addition, anglers reportedly caught two hybrids near Placer Gulch in 2009 (Jeremiah Wood, FWP personal communication).

**Table 1-1: Results of genetic analyses for trout collected in Lower Deer Creek and Placer Gulch.**

| Sample # | Sample Date | Number of Fish | Species ID | Individuals | Citation |
|---|---|---|---|---|---|
| 419(Placer Gulch) | 8/2/1990 | 10 | YCT | 10 | MFISH database |
| 314 | 8/31/1989 | 25 | YCT | 25 | Leary 2007 |
| 3309 | 3/30/2005 | 21 | YCT<br>YCTxRBT | 13<br>8 | Leary 2006 |
| 3320 | 10/2/2006 | 31 | YCT | 31 | Leary 2007 |
| 3727 | 8/11/2008 | 37 | YCT<br>YCTxRBT | 36<br>1 | Leary 2008 |

The presence of hybridized fish in Lower Deer Creek was an alarming find that spurred considerable planning and action to protect the remaining pure Yellowstone cutthroat trout. In 2006, the Derby Fire burned much of the Lower Deer Creek watershed, resulting in additional concern for the watershed's cutthroat trout. Establishing a secure brood stock of Lower Deer Creek fish was the first action to secure this population in face of these threats. In 2006, FWP moved fish to Thiel Creek, a stream near Red Lodge that lacks the genetic threats posed by rainbow trout. In 2009, FWP used artificial redds to establish pure Yellowstone cutthroat trout in Lower Deer Creek above the barrier falls. Mechanical suppression of brown trout occurred during sampling efforts to obtain spawning cutthroat trout, with the goal of decreasing proximate pressure on the resident cutthroat trout. As these actions were underway, FWP began a search for a site to construct a barrier that would prevent upstream movement of hybrids and other nonnative fishes (Olsen and Endicott 2008). The preferred location was on a state section, located one mile north of the boundary with the Gallatin National Forest. This site met the physical requirements for barrier construction, namely lateral confinement between rock walls, and protected enough habitat to support a Yellowstone cutthroat trout over the long term.

### 1.8.3 Barrier Construction

The first component of this plan to protect Lower Deer Creek's cutthroat trout population would be construction of a barrier that would prevent upstream movement of fish. Fish barriers are a common tool in conservation of native cutthroat trout. Several factors inform design and placement of fish barriers. These include biological considerations, basin hydrology and flood hazards, debris loading, and physical setting.

Biological considerations include availability of sufficient habitat above the barrier to support a population of cutthroat trout over the long-term. Population size is a major determinant of the long-term persistence of fish populations, and population size is often directly related to the length of stream occupied by fish. Smaller populations are more vulnerable to inbreeding, and random events, such as fire, drought, and disease. Moreover, barriers that do not protect enough habitat may also cut off important spawning, rearing, or overwintering habitat. Research on cutthroat trout indicates a minimum of 5 miles of habitat is required to maintain a viable fishery (Hildebrand and Kershner 2000). Constructing the barrier at the selected location would provide nearly 11 miles of stream habitat. Combining this with available habitat above the falls yields about 5 miles of secure habitat for pure Yellowstone cutthroat trout, which has substantial conservation value.

The other biological considerations relate to the ability of fish to leap over barriers, and preventing this from occurring. The design parameters for this barrier incorporate the leaping and swimming abilities of fish, and lessons learned from previously constructed barriers that experienced a functional failure by passing fish. The standard barrier design entails a concrete structure with a 4 to 6 foot drop over a flat front, and concrete apron on the downstream end (Figure 1-4). Recent observations at a similar barrier in Montana found rainbow trout were able to breach the barrier by taking advantage of hydraulics associated with the curtain of falling water. Fish that were able to leap across the apron and through the waterfall, ended up in a standing wave behind the falling water. These fish then jumped vertically from that turbulent area to gain access over the barrier.

**Figure 1-4: Constructed barrier at Crooked Creek showing typical design.**

The design for this barrier has two substantial modifications that eliminate the features that rainbow trout are able to exploit in clearing the standard design (Figure 1-5). The first alteration is extension in the length of the concrete apron. The original intent of concrete aprons was to provide a feature that prevents formation of a plunge pool downstream of the structure that would give fish a vantage from which to leap. For this barrier, an extended apron would be the first impassable feature of the barrier, and the apron would be longer than the horizontal leaping ability of fish. Fish leaping onto the apron would not reach the waterfall, but hit supercritical flows on the apron, which would sweep them downstream. In addition, installation of large rock at the downstream end of the apron would prevent formation of a plunge pool that would allow fish to leap onto the apron.

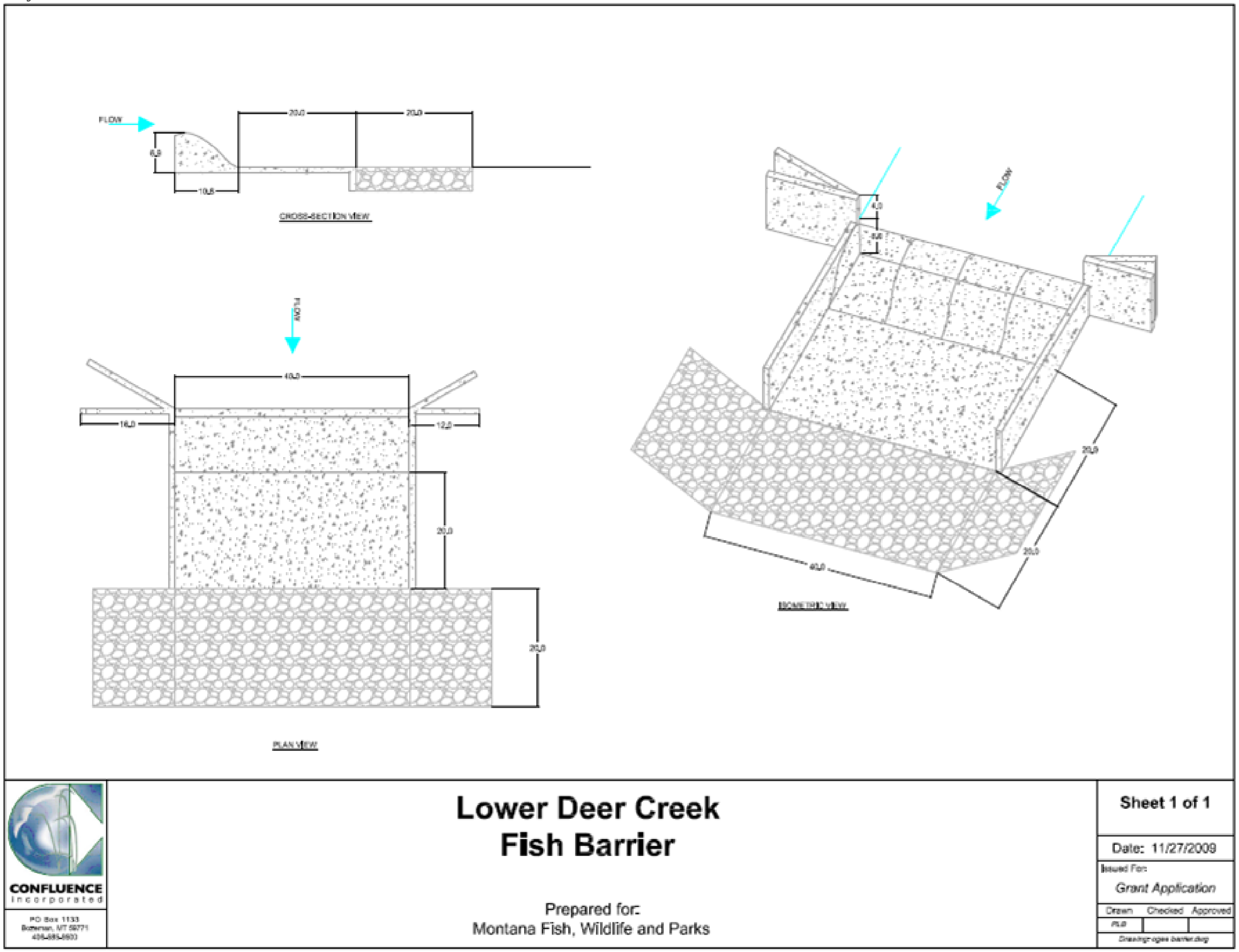


**Figure 1-5: Conceptual design for the constructed barrier.**

The second modification from standard barrier design entails replacing the flat front of the barrier with a curved, or ogee, front (Figure 1-5). This backward S curve does not allow formation of the standing wave that rainbow trout exploited in leaping over the barrier discussed above. Water would cling to the curve as it spills over the structure, producing velocities greater than burst speeds of trout, and providing the second impassable feature of the structure.

Hydrologic and safety considerations address long-term stability of the concrete barrier. The proposed barrier for Lower Deer Creek is designed to withstand a 100-year flood event. Material selection and construction of the concrete barrier would follow all codes and standards of the American Concrete Institute and the American Society for Testing and Materials, now know as ASTM International. Periodic removal of woody debris and maintenance checks are the other actions that would ensure the long-term stability of the structure.

### 1.8.4 Piscicide Treatment

FWP has a long history of using rotenone to manage fish populations in Montana, spanning as far back as 1948. The department has administered rotenone projects for a variety of reasons, but rotenone is principally applied to improve angling quality or for native fish conservation. This project is a native fish conservation project intended to eliminate the threats posed by nonnative brown trout and rainbow trout x Yellowstone cutthroat trout hybrids.

Rotenone is a naturally occurring substance derived from the roots of tropical plants in the pea family (Fabaceae), such as the jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.), which are found in Australia and its surrounding Pacific islands, southern Asia, and South America. Native people have used locally available rotenone for centuries to capture fish for food. Fisheries managers in North America have used rotenone since the 1930s. Rotenone is also a natural insecticide, and is used in organic gardening and to control parasites such as lice on domestic livestock (Ling 2002).

Rotenone acts by inhibiting oxygen transfer at the cellular level. Fish are especially vulnerable to low levels of rotenone, as they readily absorb rotenone into the bloodstream through the thin cell layers of the gills. Mammals, birds, and other non-gill breathing organisms lack this rapid absorption route into the bloodstream, and can tolerate exposure to concentrations that are much higher than levels that are lethal to fish.

The rotenone-treated area on Lower Deer Creek would extend from the barrier waterfall on the Gallatin National Forest downstream approximately 11 miles to the constructed barrier on the parcel of state land (Figure 1-6). In addition, treatment would also occur within the fish-bearing tributaries: Placer Gulch and West Fork Lower Deer Creek. Other tributaries are either ephemeral, or lack sufficient flow or habitat to support fish; however, installation of drip stations near the confluence of these streams with Lower Deer Creek would eliminate the potential for fish to seek refugia in these streams. A detoxification station would be established at the constructed barrier to limit the spatial extent of the treatment area. The detoxification zone would extend from the barrier to a distance of 15 to 30 minutes of flow travel time downstream, which is typically about ¼ to ½ miles for a stream the size of Lower Deer Creek.

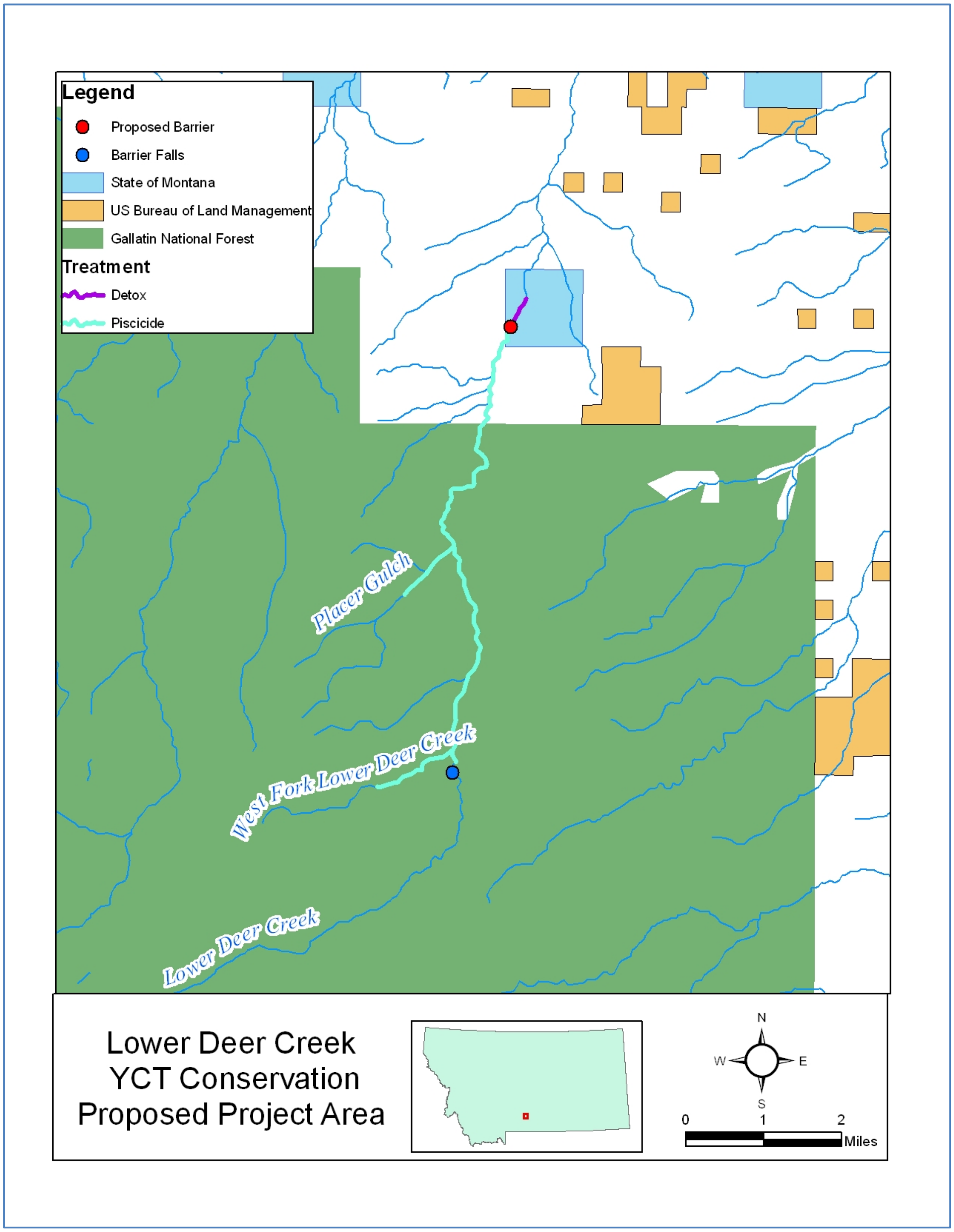


**Figure 1-6: Close up view of proposed project area.**

The proposed piscicide for this action is CFT Legumine[1], a relatively new formulation using rotenone as the active ingredient. CFT Legumine has several advantages over other formulations of rotenone, including a new emulsifier and solvent that reduce the presence of petroleum hydrocarbon solvents. The hydrocarbons in other rotenone formulations are highly volatile, resulting in a distinct chemical odor during treatment. Fish may be able to detect the hydrocarbons in other formulations, and avoid treated waters, resulting in incomplete fish kills. Because of the lack of hydrocarbons, the new formulation is expected to have fewer of these drawbacks. CFT Legumine has been used successfully in several recent rotenone treatments in Montana.

Application of piscicide would follow established methodologies, consistent with the product's labeling, as required by federal law. CFT Legumine would be applied to achieve a concentration of up to 1 ppm (part per million) of rotenone. The amount of chemical needed to reach the correct concentration would be calculated by determining the amount of stream flow present in multiple locations of the creek and each of the tributaries. At each application location, a gravity-fed, constant head drip station (Figure 1-7) would deliver diluted chemical at the appropriate rate. Drip stations would be run for 4-8 hours to ensure adequate mixing throughout the stream. Drip stations would be spaced at varying intervals in the stream to recharge the initial rotenone drip as it naturally breaks down in the stream. The spacing of these drip stations would be calculated based on bioassay experiments performed in the stream prior to the treatment .

Application of piscicide to backwater area or areas not connected to the main creek would entail the use of backpack sprayers; however, this method would be minimal in Lower Deer Creek given the lack of backwaters and wetland meadows in the treatment area. Sentinel fish (Yellowstone cutthroat trout from the Big Timber hatchery held in cages) would be placed above each drip station to confirm that a concentration of rotenone lethal to fish was present throughout the area.

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CFT Legumine™
CWE Properties Ltd, LLC
P.O. Box 336277
Greeley, Colorado 80633

**Figure 1-7: Example of a drip station used to deliver piscicide to streams.**

Rotenone detoxifies through three potential mechanisms: natural oxidation, dilution by freshwater, and introduction of a neutralizing agent, such as potassium permanganate ($KMnO_4$). In Lower Deer Creek, application of $KMnO_4$ is the proposed method to expedite detoxification. $KMnO_4$ application would follow CFT Legumine label instructions for detoxifying streams, with concentrations between 2 and 4 ppm. Sentinel fish in cages above the $KMnO_4$ application site will signal the need for beginning detoxification. Detoxification would be terminated when replenished fish survive and show no signs of stress for at least four hours. As $KMnO_4$ requires between 15 to 30 minutes contact time to detoxify rotenone, sentinel cages would be placed at sites located 15 and 30 minutes of travel time downstream of the detoxification station. In Lower Deer Creek, this should be a distance of ¼ to ½ stream miles. Survival of the caged fish would be indicative of successful detoxification. In addition, a supplemental detoxification station would be placed downstream of the initial station in the event that rotenone was not completely detoxified where planned.

In areas where the creek is visible to Gallatin National Forest visitors, dead fish would be netted from the stream and buried in the ground near the stream bank to the extent possible. In areas difficult to access, dead fish would decompose naturally in the stream and become food for scavengers.

Following the first treatment, a second treatment would take place within the same week to ensure that the initial treatment was successful. If no fish were killed during the second treatment, fish removal would be considered a success, the stream would be allowed to detoxify and Yellowstone cutthroat trout would be reintroduced. If some fish were killed during the second treatment, indicating that the first treatment was not completely successful, a third treatment would be considered. Time between treatments would be minimized to the extent possible because: 1) cutthroat trout would be held in live cars or cages outside of the treatment area awaiting reintroduction; and 2) treatment must be completed before the brown trout spawning period, which begins in late fall.

Monitoring is an important component of this type of management activity (Meronek et al. 1996), and allows evaluation of the short-term and long-term effects of piscicide treatments. For example, in 2005, FWP conducted extensive monitoring of piscicide treatment in Martin Creek and Martin Lakes, near Olney, Montana. The stream naturally detoxified from degradation and dilution within 48 hours, and detoxification with $KMnO_4$ effectively contained treatment to within the established project boundary. Monitoring the following spring found Columbian spotted frogs (*Rana luteiventris*) depositing eggs in the reclaimed lake.

Monitoring proposed for this project involves a basic approach to document fish, macroinvertebrates, birds, reptiles, amphibians, and mammals before treatment with rotenone. These surveys would be repeated in the subsequent two years. Monitoring of fish populations would then occur on a 5-year basis, with the intent of evaluating the effectiveness of the barrier in blocking nonnative fish, and determining the genetic status of the protected Yellowstone cutthroat trout population.

### 1.8.5 Reintroduction of Yellowstone Cutthroat Trout to Lower Deer Creek

The final phase of this project would entail reintroduction of Yellowstone cutthroat trout to Lower Deer Creek. The initial step of this phase would be a fish rescue involving capture of Yellowstone cutthroat trout using electrofishing. The goal is to capture 500 to 1,000 cutthroat trout, or as many as possible for reintroduction. Fish would be held in live cars in upstream areas outside of the treatment area. After the piscicide treatment was complete, fieldworkers would return these fish to the project area.

Several actions would ensure only pure Yellowstone cutthroat trout would be reintroduced into Lower Deer Creek. Rescue efforts would occur only in areas where hybridization has not been detected. In addition, genetic testing of a subsample of captured fish would provide 99% certainty that no hybrids were present. Careful examination of each fish by experienced biologists would also reduce the potential to introduce hybrids by accident. Note that previously identified hybrids were easy to identify in the field.

### 1.8.6 Reintroduction of Mottled Sculpin to Lower Deer Creek

Mottled sculpin are present in Lower Deer Creek; however, the upstream extent of their distribution is unknown. Fisheries surveys within the privately owned portions of Lower Deer Creek have found mottled sculpin; however, this species has not been found higher in the watershed, within the Gallatin National Forest. If present within the treatment area, piscicide treatment would result in elimination of mottled sculpin from these waters.

Reintroduction of mottled sculpin would mitigate for loss of this species from treated waters. Mottled sculpin would be salvaged along with Yellowstone cutthroat trout, and returned to Lower Deer Creek after piscicide treatment was complete. If no mottled sculpin are present in reaches where cutthroat trout salvage occurs, but are present within the treatment area, mottled sculpin from downstream of the barrier would be reintroduced to the project area. FWP would follow its wild fish transfer procedures in moving fish above the barrier, which includes provisions for disease testing as warranted. The result of this action would be restoration of the native fish assemblage within Lower Deer Creek.

### 1.8.7 Funding

Funding for this project comes from a variety of sources. Barrier construction is the largest expense, and a diverse group of state, federal, and private entities contributed towards this component. Project implementation would involve a partnership between FWP and the Gallatin National Forest. Operating budgets of these agencies would cover costs associated with piscicide treatment (chemicals and labor), restocking, and monitoring.

## *1.9 Agencies Consulted During Preparation of the Draft EA*

FWP consulted with three state agencies or entities. The Gallatin National Forest is a collaborator and financial contributor to this project, and has been consulted throughout the planning process. The Montana Department of Natural Resources and Conservation (DNRC) owns the property where the barrier would be constructed. As a signatory of the cutthroat trout conservation MOU, DNRC supports this project. In addition, DNRC's Dam Safety Program will review design and construction plans to evaluate the structural stability of the fish barrier.

The Montana Department of Environmental Quality (DEQ) has authority of water quality, and discharges of piscicides into surface waters. FWP has applied for 308 and 318 authorization from DEQ, which are short-term exemption from water quality standards associated with increases in sediment loading from barrier construction, and the discharge of piscicide.

The Montana Natural Heritage Program (MNHP) is part of the Natural Resource Information System, and a service of the Montana State Library. The MNHP is the source for objective information on plant and animal species in Montana, and this information allowed evaluation of potential impacts on other species. In addition to information on their website, the preparer of this EA contacted Bryce Maxell to obtain his professional judgment on the potential of this project to have adverse effects on amphibians.

# 2.0 ENVIRONMENTAL REVIEW

## *2.1 Physical Environment*

### 2.1.1 Land Resources

| **1. Land Resources** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Soil instability or changes in geologic substructure? | | | X | | Yes | 1a |
| b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil, which would reduce productivity or fertility? | | | X | | Yes | 1b |
| c. Destruction, covering, or modification of any unique geologic or physical features? | | X | | | | |
| d. Changes in siltation, deposition, or erosion patterns that may modify the channel of a river or stream, or the bed or shore of a lake? | | | X | | YES | 1c |
| e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard? | | X | | | | |

***Comments on 1a, 1b, and 1c: Effects on Soil Productivity, Erosion and Deposition***
If the proposed action is implemented, a fish barrier would be constructed on state-owned land on Lower Deer Creek, which has potential to affect soil productivity, and erosion. The construction plan for this project calls for minimizing the footprint of disturbance, implementing erosion control BMPs, and reclaiming disturbed areas. As a result, the effects of barrier construction would be short-term and minor.

### 2.1.2 Water

| **2. Water** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Discharge into surface water or any alteration of surface water quality, including but not limited to temperature, dissolved oxygen, or turbidity? | | | X | | YES | 2a |
| b. Changes in drainage patterns or the rate and amount of surface runoff? | | X | | | | |
| c. Alteration of the course or magnitude of flood water or other flows | | X | | | | 2c |
| d. Changes in the amount of surface water in any body of water, or creation of a new body of water? | | X | | | | |
| e. Exposure of people or property to water-related hazards such as flooding? | | X | | | | See 2c |
| f. Changes in the quality of groundwater? | | X | | | | 2f |
| g. changes in the quantity of groundwater? | | X | | | | |
| h. Increase in risk of contamination of surface water or groundwater? | | X | | | | See 2a and 2f |
| i. Effects on any existing water right or reservation? | | X | | | | 2i |
| j. Effects on other water users as a result of any alteration in surface or groundwater quality? | | X | | | | |
| k. Effects on other users as a result of any alteration in surface or groundwater quantity? | | X | | | | 2k |
| l. Would the project affect a designated floodplain? | | | | | | |
| m. Would the project result in any discharge that would affect federal or state water quality regulations? | | | X | | | 2m |

***Comment 2a: Alterations in Water Quality***

Potential impacts to water quality relate to construction activities, piscicide treatment, and presence of dead fish following treatment. Implementation of a number of best management practices (BMPs) and associated mitigative activities would limit the duration and severity of alterations in surface water quality associated with the proposed actions.

Barrier construction would result in a temporary increase in turbidity or sediment loading. Implementation of construction BMPs would minimize delivery of sediment during the construction process. Reclamation of the disturbed areas would limit sediment delivery after the project is completed. In addition, construction activities would follow conditions of all relevant permits required to work in and around Lower Deer Creek, including: the Montana Stream Protection Act (SPA 124), Short-Term Water Quality Standard for Turbidity (318 authorization), and federal Clean Water Act (404) permits. Each permit requires implementation of BMPs or mitigative actions, such as site reclamation, to limit negative effects on water quality.

This project would involve discharge of rotenone into Lower Deer Creek. Rotenone is an insecticide commonly used in organic agriculture and home gardening, as well as being an effective piscicide. Rotenone comes from the roots and stems from a variety of tropical and subtropical plants in the pea family (Fabaceae). The empirical formula of this isoflavonoid compound is $C_{23}H_{22}O_6$. Carbon comprises 70% of its molecular weight, and hydrogen and oxygen constitute 6% and 24% respectively. Compared to other piscicides, rotenone is relatively inexpensive and accessible, and has been routinely used to remove unwanted fish from lakes and streams. Rotenone acts by blocking the ability of tissues to use oxygen, which causes fish to asphyxiate quickly.

Rotenone is a highly reactive molecule, a factor favoring its quick decomposition in the environment. This degradability is in marked contrast to some pesticides used in nonorganic agriculture. Organochlorines are synthetic pesticides comprised of chlorinated hydrocarbons, and include chemicals such as DDT, heptachlor, and chlordane. These compounds persist in the environment long after their release, making the behavior and fate of organochlorine pesticides substantially different from rotenone, which breaks down within days in a stream environment.

Organophosphates are another class of pesticide that differs markedly from rotenone in terms of threats to human health and the environment. Commonly used organophosphate pesticides include malathion, parathion, and diazinon. Although these chemicals are considerably less persistent than the organochlorines, they are more acutely toxic, and act as potent neurotoxins. Organophosphate poisonings are one of the most common causes of poisoning worldwide. In contrast, rotenone does not share this acute toxicity to humans with the organophosphate pesticides.

CFT Legumine is the rotenone formulation proposed for this project. The EPA has registered this formula (Reg. No. 75338-2), and approved its use as a piscicide. Information on its chemical composition, persistence in the environment, risks to human health, and ecological risks come from a number of sources including material data safety sheets (MSDS) and manufacturer's instructions. (A MSDS is a form detailing chemical and physical properties of a compound, along with information on safety, exposure limits, protective gear required for safe handling, and procedures to handle spills safely.) In addition, a recent study presented an analysis of major and trace constituents in CFT Legumine, evaluated the toxicity of each, and examined persistence in the environment (Fisher 2007).

The MSDS for CFT Legumine lists three categories of ingredients for this formula (Table 2-1). Rotenone comprises 5% of CFT Legumine by weight. Associated resins account for 5%, and the remaining 90% are inert ingredients, of which the solvent n-methylpyrrolidone is a component. Additional information in the MSDS confirms its extreme toxicity to fish. The TVL addresses risks to human health from exposure, which is addressed in 8a.

**Table 2-1: Composition of CFT Legumine from material safety data sheets (MSDS)**

| *Chemical Ingredients* | *Percentage by Weight* | *CAS. No.*[1] | *TLV*[2] *(units)* |
|---|---|---|---|
| Rotenone | 5.00 | 83-79-4 | 5 $mg/m^3$ |
| Other associated resins | 5.00 | | |
| Inert ingredients including n-methylpyrrolidone | 90 | 872-50-4 | Not listed |

[1]Chemical abstracts number
[2]A TLV reflects the level of exposure that the typical worker can experience without an unreasonable risk of disease or injury.

Fisher (2007) analyzed chemical composition of CFT Legumine, including the inert fraction (Table 2-2). On average, rotenone comprised 5% of the formula, consistent with MSDS reporting. Other constituents were solvents or emulsifiers added to assist in the dispersion of the relatively insoluble rotenone. DEGEE, or diethyl glycol monoethyl ether, a water-soluble solvent, was the largest fraction of the CFT Legumine analyzed. Likewise, n-methylpyrrolidone comprised about 10% of the CFT Legumine. The emulsifier Fennedefo 99™ is an inert additive consisting of fatty acids and resin acids (by-products of wood pulp and common constituents of soap formulations), and polyethylene glycols (PEGs), which are common additives in consumer products such as soft drinks, toothpaste, eye drops, and suntan lotions. Trace constituents included low concentrations of several forms of benzene, xylene, and naphthalene. These organic compounds were considerably lower than measured in Prenfish, another commercially available formulation of rotenone, which uses hydrocarbons to disperse the piscicide. Their presence in trace amounts in CFT Legumine relates to their use as solvents in extracting rotenone from the original plant material.

**Table 2-2: Average percent concentrations and ranges of major constituents in CFT Legumine lost to be used in a piscicide project in California (Fisher 2007).**

| *Major CFT Legumine Formula Constituent* | *Rotenone* | *Rotenolone* | *n-methylpyrrolidone* | *DEGEE[1]* | *Fennedefo 99* |
|---|---|---|---|---|---|
| Average % | 5.12 | 0.718 | 9.8 | 61.1 | 17.1 |
| Range | 4.64-5.89 | 0.43-0.98 | 8.14-10.8 | 58.2-63.8 | 15.8-18.1 |

[1]diethyl glycol monoethyl ether

Toxicity to nontarget organisms and persistence in the environment are major considerations in determining the potential risks to human health and the environment, and several factors influence rotenone's persistence and toxicity. Rotenone has a half-life of 14 hours at 24 °C, and 84 hours at 0 °C (Gilderhus et al. 1986, 1988), meaning that half of the rotenone is degraded and is no longer toxic in that time. As temperature and sunlight increase, so does degradation of rotenone. Higher alkalinity (>170 mg/L) and pH (>9.0) also increase the rate of degradation. Rotenone tends to bind to, and react with, organic molecules rendering it ineffective, so higher concentrations are required in streams with increased amounts of organic debris. Without detoxification, rotenone would degrade to nontoxic levels in one to several days due to its break down and dilution in the aquatic environment.

Mitigative activities proposed would further reduce the spatial and temporal extent of rotenone toxicity. A detoxification station established immediately below the constructed barrier would release up to 4 mg/L of $KMnO_4$. This strong oxidizer rapidly breaks down rotenone into nontoxic constituents of carbon, oxygen, and hydrogen, with total breakdown occurring within 15 to 30 minutes of exposure. $KMnO_4$ in turn breaks down into potassium, manganese, and water, which are common constituents in surface waters, and have no deleterious effects at the concentrations used (Finlayson et al. 2000). The result of release of $KMnO_4$ on water quality would be elimination of toxic concentrations of rotenone.

Concentration of rotenone in treated waters is another factor relating to potential effects from incidental ingestion by other organisms, including humans. The effective concentration of rotenone is 1 ppm or 1 mg/L, which is well below concentrations harmful to humans from ingestion. The National Academy of Sciences suggested concentrations at 14 ppm would pose no adverse effects to human health from chronic ingestion of water (NAS 1983). Moreover, concentrations associated with acute toxicity to humans are 300-500 mg per kilogram of body weight (Gleason et al. 1969), which means a 160-pound person would have to drink over 23,000 gallons in one sitting to receive a lethal dose (Finlayson et al. 2000). Similarly, risks to wildlife from ingesting treated water are low. For example, ¼-pound bird would have to consume 100 quarts of treated water, or more than 40 pounds of fish and invertebrates within 24 hours for a lethal dose (Finlayson et al. 2000). The EPA, in their recent reregistration evaluation of rotenone (EPA 2007), concluded that exposure to rotenone, when applied according to label instructions, presented no unacceptable risks to humans and wildlife. In summary, this project would have no adverse effect on humans or wildlife associated with ingesting water, dead fish, or dead invertebrates.

Bioaccumulation of rotenone would not result in threats to human health and the environment under this alternative. Rotenone can bioaccumulate in the fat tissues of fish that are not exposed to toxic levels (Gingerich and Rach 1985). As a complete fish-kill is the goal, bioaccumulation would not be a problem.

Potential toxicity and persistence of the other constituents of the CFT Legumine formulation are additional considerations. Proposed concentrations of n-methylpyrrolidone (about 2 ppm) would have no adverse effects to humans ingesting treated waters. According to the MSDS, ingestion of 1000 ppm per day for three months does not result in deleterious effects to humans. In addition, n-methylpyrrolidone will not persist in surface waters given its high biodegradability. In fact, this feature, combined with its low toxicity, makes methylpyrrolidone a commonly used solvent in wastewater treatment plants.

Fisher (2007) examined the toxicity and potential persistence of other major constituents in CFT Legumine, including DEGEE, fatty acids, PEGs, and trace organic compounds, (benzene, xylene, naphthalene). With proposed application of CFT Legumine, none of these compounds would violate water quality standards, nor would they reach concentrations shown to be harmful to wildlife or humans. Furthermore, persistence of these chemicals was not a concern. The trace organics would degrade rapidly through photolytic (sunlight) and biological mechanisms. Likewise, the PEGs would biodegrade in a number of days. The fatty acids would also biodegrade, although they would persist longer than the PEGs or benzenes. Nonetheless, these are not toxic compounds, so the relatively longer persistence would not adversely affect water quality. Overall, the low toxicity, low persistence, and lack of bioaccumulation indicate the inert constituents in CFT Legumine would have a minor and temporary effect on water quality.

To reduce the potential risks associated with the use of CFT Legumine, the following management practices, mitigation measures, and monitoring efforts would be employed:

1. A pretreatment bioassay would be conducted to determine the lowest effective concentration and travel time of the chemical in the stream.
2. Signs would be posted at trailheads and along the stream to warn people not to drink the water or consume dead fish.
3. Piscicides would be diluted in water and dripped into the stream at a constant rate using a device that maintains a constant head pressure.
4. A detoxification station would be set up downstream of the target reach. Potassium permanganate ($KMnO_4$) would be used to neutralize the piscicide at this point.

5. An additional detoxification will be established downstream from the initial detoxification station as a safeguard.
6. Project personnel would be trained in the use of these chemicals including the actions necessary to deal with spills as prescribed in the MSDS for CFT Legumine™
7. Persons handling the piscicide would wear protective gear consistent exposure control/personal protection gear as prescribed in the CFT Legumine™ label.
8. Only the amount of piscicide and potassium permanganate that is needed for immediate use would be held near the stream.
9. Sentinel or caged fish would be located below the detoxification station and within the target reach to determine and monitor the effectiveness of both the rotenone and potassium permanganate.

The presence and fate of dead fish would be another potential alteration of water quality associated with piscicide treatment. Decomposing fish would add nutrients to the water. This would result in short-term and minor changes in water quality as decomposition would be rapid, and scavengers would consume carcasses. Retrieving and burying dead fish would reduce potential negative influences on water quality.

***Comment 2c: Alteration in the Course or Magnitude of Floodwater***

The gradient of the stream at the proposed barrier location is steep enough to prevent a significant impoundment of water, and at 1 acre-feet, is considerably less than the 50 acre-feet required to qualify as a high-risk dam. The barrier is designed to withstand flood flows with an estimated recurrence interval of 100 years. The maintenance strategy described in 2.1.1 Land Resources will promote conveyance of debris and bedload, and maintain the stability of the structure for the long-term.

***Comment 2f: Changes in the Quality of Groundwater***

Investigations on the fate and transport of rotenone in soil and groundwater indicate this project would not alter groundwater quality. Rotenone binds readily to soils and is broken down by soil and in water (Dawson et al. 1991; Engstrom-Heg 1971, 1976; Skaar 2001; Ware 2002). Because of its strong tendency to bind with soils, its mobility in most soil types is only one inch; although, in sandy soils rotenone can travel up to three inches (Hisata 2002). Combined, the low mobility and rapid break down prevents rotenone from contaminating groundwater.

Groundwater investigations associated with several piscicide projects also indicate application of rotenone, and the inert ingredients, would not threaten groundwater quality. California investigators monitored groundwater in wells adjacent to and downstream of rotenone projects, and did not detect rotenone, rotenolone, or any of the other organic compounds in the formulated products (CDFG 1994). Likewise, case studies in Montana have concluded that rotenone movement through groundwater does not occur. For example, FWP monitored a domestic well two weeks and four weeks after applying 90 ppb of rotenone to Lake Tetrault (FWP, unpublished data). This well was down gradient from the lake, and drew water from the same aquifer that drained and fed the lake; however, no rotenone or associated constituents were detectable. FWP monitored groundwater associated with several other rotenone projects, with wells ranging from 65 to 200 feet from the treated waters. Repeated sampling occurred within periods of up to 21 days, with no detectable concentrations of rotenone or the inert ingredients found.

One well with potential hydrologic connectivity to Lower Deer Creek is within the treatment area. Its coordinates within the Groundwater Information Center's database place it on a hillside adjacent to the stream. This well is associated with a water right for domestic and stock water use, which suggests its location is likely closer to an unoccupied home site, located about 100 meters from Lower Deer Creek. Should the piscicide treatment proceed, FWP would verify the location of the well, and coordinate with the landowner, with monitoring occurring if the dwelling will be occupied during treatment. Otherwise, as water leaving Lower Deer Creek must flow through soil and gravel, and rotenone binds readily with these substances, we would not anticipate contamination of groundwater. Similarly, the inert ingredients in CFT Legumine degrade rapidly, and would not pose a threat to the environment or reach this well.

***Comment 2i: Effects on Water Rights***

This project would not have any effect on existing water rights. Notably, the channel upstream of the barrier is steep enough that the structure would not impound a significant amount of water. Furthermore, the steep, adjacent canyon walls limit sun exposure that would drive evaporation off the surface of the impounded reach.

***Comment 2k: Effects on Other Water Users***

Rotenone treatment has potential to affect irrigation uses and swimming. CFT Legumine's label prohibits irrigation of crops with treated water, and prohibits "release within ½ mile upstream of a potable water or irrigation diversion". The label prohibits swimming in rotenone-treated water "until the application has been completed, and all pesticide has been thoroughly mixed into the water according to labeling instructions."

Project timing, distance from irrigated agriculture, and detoxification would prevent effects on irrigation uses. Treating Lower Deer Creek after irrigation had ended for the season would eliminate the potential for exposing crops to piscicide. Moreover, the treated area is over 3 river miles from the nearest irrigation diversion, and the combination of dilution, natural breakdown, and application of $KMnO4$ would degrade rotenone to nontoxic levels within 15 to 30 minutes of travel time from the barrier.

Scheduling treatment in the fall would likely eliminate the potential for human health risks associated with contact recreation. Swimming is an unlikely occurrence in this small, mountain stream in the fall. Nonetheless, to prevent unintentional exposure, FWP would post signs at trailheads and campsites that inform the public of the piscicide treatment, and the temporary restriction of contact with treated water. If deemed necessary, FWP would request that the

Gallatin National Forest close the Placer Gulch trail, the only logistical public access to the area, during the days when rotenone application would take place.

***Comment 2m: Discharge Affecting Water Quality Regulations***
This project would involve discharge of CFT Legumine, an EPA registered piscicide, to Lower Deer Creek and its select tributaries. Montana state law (MCA 75-5-308) allows application of registered pesticides to control nuisance aquatic organisms, or to eliminate undesirable and nonnative aquatic species. FWP would apply for a short-term exemption from surface water standards, or 308 authorization, from DEQ, and abide by the requirements of the authorization. These requirements call for minimizing the concentration and duration of chemical to the extent practicable. We would accomplish this by performing a bioassay to determine the lowest, effective concentration of rotenone. Other requirements of 308 authorization require preventing significant risk to public health, and ensuring that existing and designated uses of state water are protected and maintained upon completion of the activity. Comment 2a and 8c, address risks to the environment and public health, which would be short-term and minor, or negligible.

Barrier construction would result in short-term increases in turbidity associated with ground disturbance. FWP would apply for 318 authorization, which provides short-term water quality standards for turbidity. As with 308 authorization, this permit requires minimization of the magnitude and duration of increased sediment loading. The construction plan would detail sediment control efforts, construction BMPs, and site reclamation actions, all designed to minimize delivery of sediment to Lower Deer Creek.

### 2.1.3 Air

| **3. Air** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Emission of air pollutants or deterioration of ambient air quality? | | | X | | | 3a |
| b. Creation of objectionable odors? | | X | | | | 3b |
| c. Alteration of air movement, moisture, or temperature patterns, or any change in climate, either locally, or regionally? | | X | | | | |
| d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants? | | X | | | | |

***Comments 3a: Emission of Air Pollutants or Deterioration of Ambient Water Quality***
Barrier construction would entail use of heavy equipment, which emits diesel exhaust. This would be minor and temporary, as these fumes dissipate rapidly. Likewise, mixing concrete

would result in result in creation of dust.  Particulates would disperse and settle quickly resulting in short-term and minor alterations in air quality.

***Comments 3b: Creation of Objectionable Odors***
Piscicide treatment has potential to create objectionable odors.  Compared to other rotenone formulations that use aromatic hydrocarbons to disperse rotenone, CFT Legumine does not present substantial concerns regarding odor, and has considerably lower inhalation risks. Following label instructions, respiratory protection would be required when working with undiluted product in a confined space.  Otherwise, any odors from CFT Legumine application in the field would be short-term and minor because of rapid dissipation.

Decaying fish present another cause of objectionable odor in the treatment area, although applicators on past projects report most fish sink to the bottom of the stream, where odors from decomposition are not noticeable.  Applying piscicide during the fall would reduce the occurrence of objectionable odors, compared to warm summer months.  In addition, fieldworkers would collect and bury fish in areas with likelihood for public use.  Overall, odors from dead fish would be short-term and minor.

### 2.1.4 Vegetation

| **4. Vegetation** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Changes in the diversity, productivity, or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)? | | | X | | Yes | 4a |
| b. Alteration of a plant community? | | | X | | Yes | 4b |
| c. Adverse effects on any unique, rare, threatened, or endangered species? | | X | | | | 4c |
| d. Reduction in acreage or productivity of any agricultural land? | | X | | | | |
| e. Establishment or spread of noxious weeds? | | | | X | | 4e |
| f. Would the project affect wetlands, or prime and unique farmland? | | X | | | | See 4b |

***Comment 4a:  Changes in the Diversity, Productivity, or Abundance of Plants***
This project would occur within the riparian corridor of Lower Deer Creek, which occupies a mountainous to foothills area on the north flank of the Beartooth Range.  Plant communities within the riparian areas typically consist of mixed shrubs, sedges, grasses, and forbs along the water line, and coniferous forest dominating a few feet above the bank full margins.  An

additional area of disturbance would occur on the bench above the barrier site. This rangeland supports mostly native grasses and forbs, and mesic shrubs.

Barrier construction would have a minor, temporary effect on the diversity, productivity, or abundance of plant species associated with ground disturbance. The construction plan would entail provisions for limiting the footprint of the disturbed area to the smallest extent possible. Likewise, reclamation of disturbed areas with application of native seed and plantings would restore vegetative cover.

During piscicide treatment, field personnel would contribute to minor trampling of vegetation along the streams. These effects would be short-term and minor. CFT Legumine does not have an effect on plants at concentrations used to kill fish.

***Comment 4b: Alteration of a Plant Community***
Creation of an impoundment upstream of the constructed barrier would alter the riparian corridor by inundating 370 feet of channel upstream of the structure. The rise in water elevation above the structure would promote growth of riparian species where mesic vegetation now grows, mitigating for inundation of riparian species.

***Comment 4c: Effects on Unique, Rare, Threatened or Endangered Species***
The Montana Natural Heritage Program lists only one plant species of special concern as occurring within the township and ranges encompassed by the proposed action - the small-winged sedge (*Carex stenoptila*). This sedge occupies a range of habitats, from dry, often rocky soil of grasslands and open forest in montane and subalpine zones, and moist soils along streams in valleys. The broad range of habitat suggests it has potential to be present along Lower Deer Creek, or on the bench above the barrier site where concrete mixing would occur. Before construction begins, biologists would survey the area slated for disturbance. If the sedge is present, flagging its locations would allow equipment and people to avoid trampling this plant.

Piscicide treatment would be unlikely to have an adverse effect on this sedge. Project implementation scheduled for fall will not coincide with the sensitive reproductive states of this plant, which occur in July and August. Therefore, if encountered by field crews, no impacts are likely from trampling or associated disturbance.

***Comment 4e: Establishment or Spread of Noxious Weeds***
Barrier construction has potential to spread noxious weeds through ground disturbance, which promotes establishment of invasive plants, and import of seeds on machinery. Several actions would mitigate for spread of noxious weeds. All machinery and vehicles would be power-washed before traveling to the site, including an undercarriage wash. Disturbed areas would be seeded with a native seed mix. Herbicides would be used as warranted and following manufacturer’s instructions, if noxious weeds become established at the construction site.

During piscicide treatment and restocking efforts, trucks and four wheelers transporting gear and personnel have potential to spread noxious weeds from seeds transported in the undercarriage. To mitigate and reduce the risk of invasion or spread of noxious weeds, all vehicles would be cleaned before arrival on site, which will include an undercarriage wash.

### 2.1.5 Fish and Wildlife

| **5. Fish and Wildlife** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Deterioration of critical fish or wildlife habitat? | | X | | | | |
| b. Changes in the diversity or abundance of game animals or bird species? | | | X | | Yes | 5b |
| c. Changes in the diversity or abundance of nongame species? | | | X | | Yes | 5c |
| d. Introduction of a new species into an area? | | X | | | | 5d |
| e. Creation of a barrier to the migration or movement of animals? | | | X | | Yes | 5e |
| f. Adverse effects on any unique, rare, threatened, or endangered species? | | | X | | Yes | |
| g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest, or other human activity)? | | | X | | | |
| h. Would the project be performed in any area in which T&E species are present, and would the project affect any T&E species or their habitat? (Also see 5f) | | | X | | | |
| i. Would the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d) | | X | | | | |

***Comment 5b: Changes in the Diversity or Abundance of Game Animals or Bird Species***

The proposed action would alter the fish community of Lower Deer Creek with the elimination of nonnative brown trout and rainbow trout x Yellowstone cutthroat trout hybrids, both of which are game species. Yellowstone cutthroat trout salvaged before piscicide treatment would be returned to Lower Deer Creek. In addition, pure Yellowstone cutthroat trout established above the barrier may be collected and transported downstream. The population above the waterfall would also serve as a source of Yellowstone cutthroat trout for the treated reach upstream of the barrier. Therefore, the effect of the proposed treatment would be removal of nonnative brown trout and hybrids; however, reestablishment of a pure population of Yellowstone cutthroat trout would mitigate for this alteration.

***Comment 5c: Changes in the Diversity or Abundance of Nongame Species***

This project would have potential to result in changes in diversity and abundance of a variety of nongame wildlife species. Range maps, observation data, and field guide information housed by the Montana Natural Heritage Program (MNHP)[2] allowed determination of species likely to occur within the project area. In addition, the MNHP is a source of information on the habitats, food preferences, and life history strategies, which informed evaluation of potential effects. This section examines the risks to wildlife associated with direct exposure to rotenone, a diminished prey base relating to reduced biomass of fish or aquatic invertebrates, or exposure to rotenone through ingestion of dead animals or treated water.

Rotenone is highly toxic to fish, and treatment would have immediate effects on fish within the treatment area. Comment 6b addresses effects on game fish, which would be minor and temporary, as restocking would restore a population of native Yellowstone cutthroat trout. Mottled sculpin are present in Lower Deer Creek; however, the upstream extent of their distribution is unclear. Electrofishing surveys within the National Forest have not found mottled sculpin, although they have been captured downstream of the forest boundary.

The following approach would mitigate for negative effects on mottled sculpin, should they be present within the project area. A fish survey would be conducted before piscicide treatment to determine if mottled sculpin are present above the barrier location. If mottled sculpin are present, they would be reintroduced to the project area by moving fish from downstream above the barrier. The action would be conducted under FWP's fish transfer policy (FWP 1996). The policy includes procedures designed to avoid disease transmission, prevent negative impacts on native species, and protect genetic diversity.

Gilled aquatic invertebrates are nontarget organisms with considerable potential to suffer negative effects from piscicide treatment. In streams, benthic populations of true flies, stoneflies, mayflies, and caddis flies would be the primary affected taxa. Owing to a number of factors, these effects would be short-term and temporary. Investigations into the effects of rotenone on benthic organisms indicate that rotenone has temporary or minimal effects on stream-dwelling invertebrates. For example, following piscicide treatment of a California stream, macroinvertebrates experienced an "explosive resurgence" in numbers, with black fly larvae recovering first, followed by mayflies and caddis flies within six weeks after treatment (Cook and Moore1969). Stoneflies returned to pretreatment abundances by the following spring. Drift and recolonization by aerial adults are the primary mechanisms of recovery, and several

[2] http://mtnhp.org/

miles of stream upstream of the treatment area will provide a source of drifting invertebrates to Lower Deer Creek. Although gill-respiring invertebrates are a sensitive group, many are far less sensitive to rotenone than fish (Schnick 1974, Finlayson et al. 2010), and would be likely to survive concentrations applied for fish removal. The well-established ability of macroinvertebrates to recover following disturbance, combined with the lower susceptibility of some taxa to rotenone, would contribute to rapid recovery of invertebrate populations.

Timing piscicide treatment for fall would reduce potential for effects on macroinvertebrates, as most of the year's crop of invertebrates would have emerged by that time. Moreover, a considerable proportion of the new crop would be in the egg phase, and not vulnerable to piscicide.

Amphibians are closely associated with water, and have potential to be exposed to rotenone during treatment. Species within the treatment area are the Columbian spotted frog (*Rana luteiventris*), the western toad (*Bufo boreas*), and the boreal chorus frog (*Pseudacris maculata*). Of these, the Columbian spotted frog has the greatest probability for exposure to rotenone, given its preference for streamside habitat. Western toads and boreal chorus frogs are largely terrestrial, except for during the breeding season, so these species have a lower probability of encountering rotenone treated waters.

Applying rotenone to Lower Deer Creek would likely have negligible effects on amphibians given the physical setting and proposed timing of piscicide application. Similar to other gill-bearing organisms, amphibian larvae are sensitive to rotenone, and exposure to rotenone at levels used to kill fish is acutely toxic to Columbian spotted frog larvae (Grisak et al. 2007). Nonetheless, the potential for exposure would be minimal in Lower Deer Creek, as this relatively high gradient mountain stream simply does not provide suitable slow water or lentic breeding habitat for frogs and toads. Likewise, treating the stream in the fall, after metamorphosis, would prevent exposure in the event unidentified beaver ponds or other backwater features were present. Fall treatment is the recommended approach to avoiding effects on amphibians (Grisak et al. 2007).

Effects on adult amphibians would be insignificant given their low vulnerability to rotenone, mobility, and project timing. Adult Columbian spotted frogs do not suffer an acute response to trout killing concentrations of Prenfish, another commonly used formulation of rotenone (Grisak et al. 2007). Adult western toads would likely be less sensitive than frogs given their impermeable skin (Maxell and Hokit 1999). Adult toads and frogs have the ability to leave the aquatic environment, which substantially reduces the potential for exposure (Maxell and Hokit 1999). Moreover, by fall, these organisms would be moving towards or occupying overwintering habitat. Western toads and boreal chorus frogs hibernate away from streams. Columbian spotted frogs hibernate in spring-fed ponds, which are unlikely to occur in the project area.

Implementation of a basic monitoring plan would allow evaluation of the short and long-term effects of piscicide treatment on potentially sensitive taxa. The macroinvertebrate sampling component would involve sampling macroinvertebrates using standard operating procedures developed by DEQ. Sample collection would occur before piscicide treatment at two locations in Lower Deer Creek, and would be repeated two weeks after treatment, then for two years afterward. Fish recovery would be evaluated using electrofishing over the course of 5 years. A survey of birds, reptiles, amphibians, and mammals would take place before treatment, and would be repeated in each of the following two years.

A temporary reduction in prey of aquatic origin has potential to influence mammals, amphibians, reptiles, birds, and bats. Mammalian predators that are likely to exploit prey of aquatic origin in Lower Deer Creek as a regular source of their diet include American mink (*Mustela vison*) and grizzly bear (*Ursus arctos*). Mink are opportunistic predators and scavengers with fish and invertebrates comprising a portion of their diet. Therefore, the reduction in density of fish and invertebrates following treatment would likely displace mink to adjacent, untreated reaches until populations recovered. Grizzly bears are opportunistic foragers, and would be resilient to a temporary reduction in fish. Conversely, these predators, along with opportunistic black bears (*Ursus americanus*), raccoons (*Procyon lotor*), red foxes (*Vulpes vulpes*), coyotes (*Canis latrans*), gray wolves (*Canis lupus*), and striped skunks (*Mephitis mephitis*) would likely consume dead fish immediately after piscicide treatment. The temporary reductions of aquatic prey, and the brief availability of dead fish, constitute short-term and minor effects on mammalian predators.

A number of bird species with potential to occur within the project area consume fish or invertebrates with an aquatic life history stage. The belted kingfisher (*Megaceryle alcyon*) consumes fish as its primary food source. The American dipper (*Cinclus mexicanus*) forages for aquatic invertebrates in mountain streams year round. Numerous species of songbird eat winged adults of invertebrates originating from streams. The effect of a reduction of forage base on these organisms would be minor and short-term. Belted kingfishers may be temporarily displaced, until Yellowstone cutthroat trout rebound in Lower Deer Creek. As rotenone does not affect all aquatic invertebrates, some invertebrate prey would remain to support American dippers, although some level of displacement is possible. Most songbirds that consume winged invertebrates would not be present during the fall treatment period. Reductions in emergence of adult insects may occur the following summer, although drift from upstream and increased survival of invertebrates not killed by piscicide would counteract these potential deficits. Overall, the effects of reduced forage on birds would be minor and temporary.

Two species of gartersnake, the common gartersnake (*Thamnophis sirtalis*) and the terrestrial gartersnake (*T. elegans*), likely occur along Lower Deer Creek, and a reduction in aquatic based food may affect these snakes. Similarly, the Columbian spotted frog regularly forages along stream margins. Effects on these reptile and amphibian predators would likely be short-term and minor, with temporary displacement or reductions in population size. Given the quick recovery expected of the fish and invertebrate prey base, gartersnakes and frogs would not experience long-term or significant effects.

Bats also consume winged insects, and therefore, rotenone projects have potential to have a negative effect on bats. Diet preferences and seasonal habitat use for bats in the project area (Table 2-3) indicate effects on bats would be negligible. Only one species is known to migrate out of Montana during the winter; however, the others would likely be hibernating during the treatment period. Review of diets indicates most of the bats species that may occur in the project area consume mostly invertebrates of terrestrial origin. Because of the rapid recovery of aquatic invertebrates, and a lack of reliance on invertebrates of aquatic origin, bats would experience no adverse effects from piscicide treatment in Lower Deer Creek.

**Table 2-3: Bats with potential to occur in the Lower Deer Creek project area, seasonal residency in Montana, and diet preferences (from MNHP field guide information).**

| ***Common Name*** | ***Scientific Name*** | ***Occupancy in Montana*** | ***Diet*** |
|---|---|---|---|
| Big brown bat | *Eptisicus fuscus* | Year-round | A variety of terrestrial and aquatic invertebrates |
| Hoary bat | *Lasiurus cinereus* | Summer only | A variety of terrestrial and aquatic invertebrates |
| Townsend's big ear bat | *Corynorhinus townsendii* | Year-round | Mostly moths, and other terrestrial invertebrates |
| Spotted bat | *Euderma maculatum* | Year-round | Moths and beetles |
| Silver-haired bat | *Lasionycteris noctivagans* | Year-round | A variety of terrestrial and aquatic invertebrates |
| California myotis | *Myotis californicus* | Year-round | No information available |
| Little brown myotis | *Myotis lucifugus* | Year-round | No information available |
| Fringed myotis | *Myotix thysanodes* | Year-round | Moths and beetles |
| Long-legged myotis | *Myotis volans* | Year-round | Mostly terrestrial invertebrates |

Ingestion of rotenone, either from drinking water, or from consuming dead fish or invertebrates, is a potential route for rotenone exposure. A substantial body of research has investigated the effects of ingested rotenone in terms of acute and chronic toxicity, and other potential health effects. An important consideration in reviewing theses studies is that most examined laboratory exposure to exceptionally high concentrations of rotenone that would not be attainable under proposed field application. The low level of effects at these super-elevated concentrations indicates risks to wildlife from exposure to proposed levels would be nil.

In general, ingestion does not affect mammals because of digestive action in their stomach and intestines (AFS 2002). Investigations examining the potential for acute toxicity from ingesting rotenone find mammals would need to consume impossibly high amounts of rotenone-contaminated water or dead animals for a lethal dose. For example, a 22-pound dog would have to drink nearly 8,000 gallons of treated water within 24 hours, or eat 660,000 pound of rotenone-killed fish within a day to receive a lethal dose (CDFG 1994). A half-pound mammal would need to consume 12.5 mg of pure rotenone, or drink 66 gallons of water treated at 1 ppm for a lethal dose (Bradbury 1986). In comparison, the effective concentration of rotenone to kill fish is 1 ppm, which is several orders of magnitude lower than concentrations resulting in acute toxicity to mammals.

Evaluations of potential exposure of various sized mammals associated with their estimated daily food intake and total body residue of rotenone within killed fish indicate acute toxicity from ingesting rotenone-killed fish is highly unlikely (EPA 2007). Estimation of the daily consumption of dead fish by an "intermediate-sized mammal" of 350 mg, which is about half the size of a male American mink, found an estimated daily dose of 20.3 µg of rotenone. This is well below the median lethal dose of 13,800 µg of rotenone for a mammal of that size. A "large mammal" is one with 1,000 g body weight, which is within the weight range for female American mink. If this size mammal fed exclusively on fish killed by rotenone, it would receive an equivalent daily dose of 37 µg of rotenone. In comparison, the estimated median lethal concentration of rotenone for a 1,000 g mammal was 30,400 µg, which is over 800 times the daily dose. The EPA (2007) concluded that piscivorous mammals were highly unlikely to consume enough fish to result in observable acute toxicity.

Chronic toxicity associated with availability of dead fish over time would not pose a threat to mammals, nor would other health effects be likely. Rats and dogs fed high levels of rotenone for six months to two years experienced only diarrhea, decreased appetite, and weight loss (Marking 1988). The unusually high treatment concentrations did not cause tumors or reproductive problems. Toxicology studies investigating potential secondary effects to rotenone exposure have found no evidence that it results in birth defects (HRI 1982), gene mutations (BRL 1982; Van Geothem et al. 1981), or cancer (Marking 1988). Rats fed diets laced with 10 to 1000 ppm of rotenone over a 10-day period did not experience any reproductive dysfunction (Spencer and Sing 1982).

Concerns over putative links to Parkinson's disease often emerge in response to potential rotenone projects. This issue relates to a study in which rats injected with rotenone for up to 2 weeks showed lesions characteristic of Parkinson's disease (Betarbet et al. 2000). Review of the methodology employed in this study finds no similarities to fisheries related piscicide projects in terms of dose, duration of exposure, or mode of delivery. The rats received constant injection of rotenone and dimethyl sulfoxide directly into their bloodstream, resulting in continuously high concentrations of rotenone. The purpose of the dimethyl sulfoxide was to enhance tissue penetration of the rotenone, as normal routes of exposure actually slow introduction of chemicals into the bloodstream. In contrast, field exposure would involve far lower concentrations of rotenone, without the potentially synergistic effects of dimethyl sulfoxide to promote uptake into tissues. Moreover, the rapid breakdown of rotenone in the environment would not support more than a few days of potential exposure from ingesting water or dead animals. Finally, continuous intravenous injection in no way resembles any potential mode of field exposure to rotenone, which would be ingestion of dilute rotenone in water, or consumption of fish or invertebrates killed by rotenone. As the injection study does not provide a model for potential effects of field application of rotenone, and other researchers have not found Parkinson's-like effects in exposed animals (Marking 1988), we conclude that rotenone application would not result in neurological risks to field exposed animals.

Birds may also scavenge dead fish and invertebrates, or ingest treated water; however, research on toxicity of rotenone to birds indicates acute toxicity was not possible from field application of rotenone to achieve a fish kill. In general, birds require levels of rotenone at least 1,000 to 10,000 times greater than is required for lethality in fish (Skaar 2001). Chickens, pheasants, and related gallinaceous birds are resistant to rotenone, and four-day-old chicks are more resistant than adults (Cutkomp 1943). Rotenone is slightly toxic to waterfowl, although acute toxicity occurs at levels 2000 times higher than the proposed treatment concentration (Ware 2002).

Evaluation of the risks to scavenging birds based on estimated daily dose and body size indicated no risk of acute toxicity from eating rotenone-killed fish (EPA 2007). The daily dose of rotenone from consumption of scavenged fish ranged from 15 µg to 95 µg. At this level of contamination, a raven-sized bird would need to consume from 43,000 to 274,000 dead fish in one day for a lethal dose (EPA 2007).

In summary, effects on nontarget species of wildlife would range from nonexistent to short-term and minor. Fish and benthic invertebrates would suffer significant mortality; however, restocking and natural recovery would result in these effects being temporary. Some species may experience temporary reductions in prey base, which may displace these animals until fish and macroinvertebrate populations rebound. Concentrations of rotenone in water and dead fish would be orders of magnitude less than levels causing acute and chronic toxicity to animals ingesting treated water or dead fish. Moreover, as rotenone degrades rapidly, the duration of potential exposure would be short, measurable in days, which would not pose long-term threats to wildlife.

***Comment 5d: Introduction of a New Species into an Area***

This project would involve returning Yellowstone cutthroat trout to Lower Deer Creek. Yellowstone cutthroat trout salvaged before piscicide treatment would be held in live cars outside of the treatment area. Likewise, mottled sculpin would be reintroduced, if they are found to be present in the project area. These fish would be returned to Lower Deer Creek after sentinel fish show no evidence of toxicity.

***Comment 5e: Creation of a Barrier to the Movement or Migration of Animals***
This project would include construction of a barrier to prevent upstream movement of fish into the project area in order to secure a pure population of Yellowstone cutthroat trout. Although this action would eliminate connectivity for Yellowstone cutthroat trout downstream of the barrier, the protection of 11 miles of habitat for pure fish has tremendous conservation benefit.

***Comment 5f: Effects on Unique, Rare, Threatened , or Endangered Animals***
The MNHP database lists several animal species of special concern as occurring in, or near the project area (Table 2-4). Field guide information provided by the MNHP website allows inference on potential effects of the project on these species. Evaluation of their habitat needs, forage base, and migration timing suggests effects on these species would be nonexistent or negligible.

Among the mammals of special concern, impacts of the proposed actions would be minor and of short duration. Construction activity and presence of field crews may temporarily displace large mammals, such as the gray wolves, wolverines, lynx, and grizzly bears, from occupied habitat. Conversely, availability of dead fish from piscicide treatment would attract scavenging animals to the stream corridor over the short-term. These effects would be minor and temporary.

Sage grouse may occupy the bench above the barrier location as it provides suitable habitat. Nonetheless, barrier construction would occur in late summer to early fall, so it would not coincide with sensitive reproductive periods. The potential effects on sage grouse would be temporary displacement during construction, which would be minor and short-term.

The Preble's shrew prefers arid habitats, so piscicide treatment and associated disturbance within the stream corridor does not pose a threat to this species. This shrew may occur on the bench above the barrier site, so equipment and activity there has potential to disrupt use of this habitat. This would be a minor and temporary intrusion. A construction plan that limits the spatial extent of disturbance and reclaims disturbed ground would minimize potential for the Preble's shrew to experience ill effects should they be present.

As this is a Yellowstone cutthroat trout conservation project, this species would ultimately benefit from this project. Yellowstone cutthroat trout would initially suffer a population loss relating to piscicide treatment. Field crews would salvage as many Yellowstone cutthroat trout as possible before treatment; however, a substantial number of Yellowstone cutthroat trout would perish from exposure to rotenone. Nonetheless, the salvaged fish would recolonize the treated portions the Lower Deer Creek watershed. This restored population would be free of competition with nonnative brown trout, and lack the genetic risks associated with cohabiting with hybrids.

**Table 2-4: Animal species of special concern known to occur in the sections encompassed by the Lower Deer Creek Yellowstone cutthroat trout conservation project.**

| Group | Scientific Name | Common Name | Global Rank | State Rank | USFWS | USFS |
|---|---|---|---|---|---|---|
| Mammals | *Canis lupus* | Gray wolf | G4[1] | S3[2] | LE[3] | Endangered |
| Mammals | *Gulo gulo* | Wolverine | G4 | S3 | | Sensitive |
| Mammals | *Lynx canadensis* | Canada lynx | G5[4] | S3 | LT[5] | Threatened |
| Mammals | *Sorex preblei* | Preble's shrew | G4 | S3 | | |
| Mammals | *Ursus arctos* | Grizzly bear | G4 | S2[6]S3 | L, DM[7] | Threatened |
| Birds | *Centrocercus urophasianus* | Greater sage grouse | G4 | S3 | | Sensitive |
| Fish | *Oncorhynchus clarkii bouvieri* | Yellowstone cutthroat trout | G4T[8]2 | S2 | | Sensitive |

[1] G4 or S4: uncommon but not rare (although it may be rare in parts of its range), and usually widespread
[2] G3 or S3: Potentially at risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global
extinction or extirpation in the state.
[3] LE: listed endangered- Any species in danger of extinction throughout all or a significant portion of its range (16 U.S.C 1532[6])
[4] G5 or S5 Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.
[5] LT: Listed threatened: Any species likely to become an endangered species within the foreseeable future throughout all or a significant
portion of its range (16 U.S.C 1532[20]).
[6] G2 or S2: At risk because of very limited and/or declining numbers, range, and/or habitat, making it vulnerable to global extinction or
extirpation in the state.
[7] DM: Delisted taxon, recovered, being monitored for first five years
[8] T: Infraspecific taxon (trinomial) – the status of infraspecific taxa (subspecies or variety) are indicated by a "T-rank" followed by the
Species' global rank

## 2.2 Human Environment

### 2.2.1 Noise and Electric Effects

| **6. Noise and Electric Effects** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Increases in existing noise levels? | | | X | | | 6a |
| b. Exposure of people to nuisance noise levels? | | X | | | | |
| c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property? | | X | | | | |
| d. Interference with radio or television reception? | | X | | | | |

***Comment 6a: Increases in Existing Noise Levels***
Barrier construction would require the use of heavy equipment, which would increase noise levels during the month-long construction period. Note that the nearest occupied dwelling is several miles away, so no neighbors would be inconvenienced by noise. In addition, there is no public access to the barrier location, so noise from heavy equipment would not affect outdoor recreationalists.

### 2.2.2 Land Use

| **7. Land Use** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Alteration of or interference with the productivity or profitability of existing land use of an area? | | X | | | | |
| b. Conflict with a designated natural area or area with unusual or scientific importance? | | X | | | | |
| c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action? | | | X | | Yes | 7c |
| d. Adverse effects on, or relocation of, residences? | | | | | | |

***Comment 7c: Conflicts with Existing Land Uses***
The proposed project has potential to affect recreational uses of public land, including fishing and hunting. As there is no public access to the barrier location, the construction component would have little potential to disrupt hunting or fishing. Piscicide treatment would coincide with general archery season, so field crews may displace some animals sought for this type of hunting. This would be a short-term disruption, lasting only several days.

The public would also have temporary restricted use of Lower Deer Creek during the piscicide treatment. The 308 authorization requires we prevent the public from being exposed to treated water. Signs posted at stream access points and trailheads would inform the public about the piscicide treatment and temporary restrictions. As fishing pressure in Lower Deer Creek is low, and contact recreation highly unlikely in the fall, these restrictions on use would be minor and restricted to several days.

Piscicide treatment would result in a temporary reduction in fish density within the project area, which would reduce the quality of the angling experience over the short-term. The population would rebound to provide the opportunity to catch native cutthroat trout in a beautiful setting.

During scoping sessions for an earlier phase of this project, some anglers expressed concern over the loss of the ability to harvest fish. Currently, fishing regulations allow anglers to keep Yellowstone cutthroat trout from Lower Deer Creek as part of their daily bag limit, and no proposed changes to these regulations are planned.

### 2.2.3 Risks/Health Hazards

| **8. Risks/ Health Hazards** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident of other forms of disruption? | | | X | | Yes | 8a |
| b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan? | | | X | | Yes | 8b |
| c. Creation of any human health hazard or potential hazard? | | | X | | Yes | 8c |
| d. Would any chemical piscicides be used? | | | X | | Yes | See 8a |

***Comment 8a: Risk of Explosion or Release of Hazardous Substances***
Fieldworkers applying piscicide would have the principal risk relating to exposure to hazardous materials. Following the exposure controls and other protective measures detailed in the MSDSs would result in protection of the safety and health of applicators. Protective gear and equipment include the use of respirators when using undiluted CFT Legumine. All applicators would wear personal protective equipment as required by label instructions.

The $KMnO_4$ applicators would also require protective clothing and gear to control exposure. Personal protection required in the MSDS includes gloves, splash goggles, synthetic apron, and vapor and dust respirator.

Field application would occur under the supervision of at least one, but most likely several licensed pesticide applicators. All individuals handling or applying chemical would receive training prior to the treatment. Materials would be transported, handled, applied, and stored according to the label specifications to reduce the probability spill or other unintended exposure.

***Comment 8b: Creation of a New Emergency Plan***
FWP requires a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear chain of command, training, delegation and assignment of responsibility, clear lines of communication between

members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by FWP, the risk of emergency response is minimal and any affects to existing emergency responders would be short term and minor.

***Comment 8c: Creation of any Human Health Hazard or Potential Hazard***
Risks to human health relate to exposure to rotenone, the inert ingredients in the CFT Legumine formulation, or $KMnO_4$ used in detoxifying rotenone. Information examined here includes an analysis of human health risks relating to rotenone exposure (EPA 2007), MSDS sheets for chemicals used, and an evaluation of the chemical constitution of the CFT Legumine formula (Fisher 2007).

Acute toxicity refers to the adverse effects of a substance from either a single exposure or multiple exposures in a short space of time. Rotenone ranks as having high acute toxicity through oral and inhalation routes of exposure, and low acute toxicity through exposure to skin (EPA 2007). Examination of acute toxicity profiles compiled by the EPA (2007) indicates this high acute toxicity would be applicable to undiluted CFT Legumine, with median lethal doses for rats ranging from 39.5 mg/kg for female rats, and 102 mg/kg for male rats. In contrast, the proposed concentration for rotenone in surface water is 1 mg/L. Therefore, field applicators would take necessary precautions to prevent ingestion or inhalation of undiluted CFT Legumine to avoid exposure to toxic concentrations of rotenone. Exposure to concentrations in surface water would not lead to acute toxicity, although only approved field personnel would be near the stream during treatment as an added protection.

In evaluating the potential for adverse effects from exposure to rotenone, the EPA (2007) calculated a number of toxicological endpoints, which address specific types of adverse effects (Table 2-5). In the case of neurotoxicity, insufficient data were available to quantify the doses to which rotenone users could be exposed without adverse effects. Application of an uncertainty factor allowed an estimate that would be protective of human health. Other uncertainty factors addressed inter- and intra-specific variability, and involved dividing the non-adverse effects level by a factor of 10 each. These toxicological endpoints allowed determination of health risks associated with ingestion, inhalation, and dermal contact with a margin of exposure that is highly protective of human health, given the inherent uncertainty with insufficient data and use of animal models in predicting effects on humans.

**Table 2-5: Toxicological endpoints for rotenone (EPA 2007).**

| Exposure Scenario | Dose Used in Risk Assessment, Uncertainty Factor (UF) | Level of Concern for Risk Assessment | Study and Toxicological Effects |
|---|---|---|---|
| Acute Dietary (females 13-49) | NOAEL = 15 mg/kg/day<br>UF = 1000<br>aRfD = 15 mg/kg/day = 0.015 mg/kg/day<br>1000 | Acute PAD = 0.015 mg/kg/day | Developmental toxicity study in mouse (MRID 00141707, 00145049)<br>LOAEL = 24 mg/kg/day based on increased resorptions |
| Acute Dietary (all populations) | An appropriate endpoint attributable to a single dose was not identified in the available studies, including the developmental toxicity studies. | | |
| Chronic Dietary (all populations) | NOAEL = 0.375 mg/kg/day<br>UF = 1000<br>cRfD = 0.375 mg/kg/day = 0.0004 mg/kg/day<br>1000 | Chronic PAD = 0.0004 mg/kg/day | Chronic/oncogenicity study in rat (MRID 00156739, 41657101)<br>LOAEL = 1.9 mg/kg/day based on decreased body weight and food consumption in both males and females |
| Incidental Oral Short-term (1-30 days) Intermediate-term (1-6 months) | NOAEL = 0.5 mg/kg/day | Residential MOE = 1000 | Reproductive toxicity study in rat (MRID 00141408)<br>LOAEL = 2.4/3.0 mg/kg/day [M/F] based on decreased parental (male and female) body weight and body weight gain |
| Dermal Short-, Intermediate-, and Long-Term | NOAEL = 0.5 mg/kg/day<br>10% dermal absorption factor | Residential MOE = 1000<br>Worker MOE = 1000 | Reproductive toxicity study in rat (MRID 00141408)<br>LOAEL = 2.4/3.0 mg/kg/day |
| Inhalation Short-term (1-30 days) Intermediate-term (1-6 months) | NOAEL = 0.5 mg/kg/day<br>100% inhalation absorption factor | Residential MOE = 1000<br><br>Worker MOE = 1000 | [M/F] based on decreased parental (male and female) body weight and body weight gain |
| Cancer (oral, dermal, inhalation) | Classification; No evidence of carcinogenicity | | |

UF = uncertainty factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, aPAD = acute population adjusted dose, cPAD = chronic population adjusted does, RfD = reference dose, MOE = margin of exposure, NA = Not Applicable

As rotenone degrades, it breaks down into degradation products including rotenoloids. The EPA considered the toxicity of these compounds, and determined that because of their structural similarities to rotenone, the degradation products are no more toxic than the parent compound.

Dietary risks considered acute dietary risks to the subgroup "females 13-49 years old", and examined exposure associated with consuming exposed fish and drinking treated surface water. In determining potential exposure from consuming fish, the EPA used maximum residues in fish tissue. The concentrations of residue considered were conservative, meaning they may have been an overestimate of the rotenone concentrations in muscle tissue, as they included non-edible tissues, where concentrations may be higher. The EPA concluded that acute dietary exposure estimates resulted in a dietary risk below the EPA's level of concern; therefore, consumption of fish killed by rotenone does not present an acute risk to the sensitive subgroup.

The EPA considered chronic dietary risks relating to exposure through drinking water. Chronic exposure from consuming exposed fish was not evaluated, given rotenone's rapid degradation and low propensity to bioaccumulate in fish. Based on the chronic toxicity endpoint, the drinking water level of concern was 40 ppb (µg/L), which addressed effects on infants and children, the most sensitive population subgroup.

In evaluating the potential for chronic exposure to rotenone, the EPA acknowledged the rapid degradation of rotenone in the environment, and that expediting deactivation with oxidizing agents, such as $KMnO_4$ was a standard procedure in many projects. The EPA concluded that no chronic exposures to rotenone would occur where water is treated with $KMnO_4$ or subject to an oxidative water treatment regime. They further concluded that persistence of chronic or sub-chronic exposures to 40 ppb for several weeks was limited to specific circumstances, such as drinking water intakes in cold-water lakes where no oxidative water treatment occurred. In Lower Deer Creek, treatment with $KMnO_4$ and natural breakdown would not present a risk to infants and children. Moreover, these surface flows are not used for domestic water sources, so potential for humans to consume treated water is exceptionally low.

The EPA estimated recreational risks associated with swimming, which would entail skin contact and incidental ingestion. For adults, the short-term risks for swimmers on the day of application did not exceed the EPA's level of concern. For toddlers, the short-term risks for swimming on the day of application exceeded the EPA's level of concern, but after 3 days, natural breakdown of rotenone resulted in concentrations below the level of concern. Even without the temporary restrictions, the likelihood that toddlers would be in contact with this mountain stream in September or October is extremely low, so piscicide treatment would not threaten the health of this demographic.

An aggregate risk is the combined risk from dietary exposure and non-occupational sources, such as residential and recreational exposure. In its evaluation of the aggregate risk, the EPA combined the risk of eating treated fish and drinking treated water, and concluded the risk does not exceed their level of concern. The EPA did not aggregate recreational risk with the dietary risk, as the dietary assessment is conservative, and recreational exposure would be intermittent and would not occur for the general population. Moreover, stream closings, detoxification, and project timing would minimize recreational exposure.

Occupational risks relate to fieldworkers mixing and applying rotenone. The EPA (2007) calculated margins of exposure for handlers mixing and applying rotenone through various methods, and with varying levels of protective gear, from none, to use of gloves, respirators, and protective clothing. The proposed approaches for this project call for use of a liquid formula applied with drip stations or backpack sprayer of seeps, springs, and backwaters (should they occur). The margins of exposures for these applications are below the level of concern with the use of gloves. Requiring protective eyewear, protective clothing, and respirators for applicators mixing rotenone would be highly protective of the health of applicators in the field.

The proposed formula for this project is CFT Legumine, which contains 5% rotenone, and 95% inert ingredients. Fisher (2007) evaluated the chemical composition of the inert fraction, the persistence of these constituents, and the potential to have an effect on human health and the environment. Comment 2a: Alterations in Water Quality (see page 19) details these findings. In general, the inert ingredients do not pose a threat to human health given their low toxicity and short period of persistence in the environment.

Finally, a description of the traditional uses of rotenone by native people is informative in evaluating its potential for creating hazards to human health. Native Brazilians have considerable exposure to rotenone through their use of this piscicide as a means to obtain fish for consumption (Teixera et al. 1984). They extract rotenone by chewing roots of the *Timbo* plant, and distribute the chewed pulp by swimming into fish-bearing waters. Despite this high level of oral and dermal exposure to rotenone, no harmful effects were apparent from this centuries old practice. Moreover, in contrast to the use of rotenone in fisheries management programs, the traditional method of applying rotenone from root does not involve a calculated target concentration, metering devices or involve human health risk precautions.

### 2.2.4 Community Impact

| **9. Land Use** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Alteration of or interference with the productivity or profitability of existing land use of an area? | | X | | | | |
| b. Conflict with a designated natural area or area with unusual or scientific importance? | | X | | | | |
| c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action? | | X | | | | |
| d. Adverse effects on, or relocation of, residences? | | X | | | | |

### 2.2.5 Public Services/Taxes/Utilities

| **10. Public Services/Taxes/Utilities** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _______________ | | X | | | | |
| b. Will the proposed action have an effect upon the local or state tax base and revenues? | | X | | | | |
| c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications? | | X | | | | |
| d. Will the proposed action result in increased used of any energy source? | | X | | | | |
| e. Define projected revenue sources | | X | | | | |
| f. Define projected maintenance costs | | X | | | | |

### 2.2.6 Aesthetics and Recreation

| **11. Aesthetics and Recreation** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view? | | X | | | | |
| b. Alteration of the aesthetic character of a community or neighborhood? | | X | | | | |
| c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report) | | | X | | Yes | |
| d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c) | | X | | | | |

***Comment 11c: Alteration of the Quality or Quantity of Recreational/Tourism Opportunities and Settings.***
Piscicide treatment would result in the elimination of brown trout, and temporary reduction in fish density, until the Yellowstone cutthroat trout population recovers. This would alter the nature of angling opportunities, and temporarily decrease the quality of the angling experience. Restocking Lower Deer Creek with pure Yellowstone cutthroat trout would mitigate these effects. The population would recover within a few years, and would provide an opportunity to fish for native fish in a beautiful setting. Meanwhile, brown trout remain abundant in the region, and anglers would have many opportunities to fish for brown trout in neighboring drainages.

Several local anglers have expressed their interest in being able to harvest fish caught in Lower Deer Creek. Currently, fishing regulations allow anglers to keep cutthroat trout in Lower Deer Creek. No changes to these regulations have been proposed.

### 2.2.7 Cultural/Historical Resources

| **12. Cultural and Historical Resources** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Would the proposed action result in: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance? | | X | | | | |
| b. Physical change that would affect unique cultural values? | | X | | | | |
| c. Effects on existing religious or sacred uses of a site or area? | | | X | | Yes | 12c |
| d. Will the project affect historic or cultural resources? | | X | | | | 12d |

***Comment 12c: Effects on Existing Religious or Sacred Uses of a Site or Area.***
Through the MEPA process, FWP has a responsibility to recognize the importance of cultural or religious territories, or territory considered sacred to Indian tribes, and to evaluate the potential for a proposed action to affect these values. The Crow Indians, or more properly, the Apsáalooke, were the resident group of Native Americans in the area (Lahren 2006). In April 2010, FWP contacted the Crow Tribal Council with an inquiry about potential sites with cultural values. To date, FWP has not received any response. The Crow Tribe will be provided a copy of this EA, and FWP will address any comments accordingly.

***Comment 12d: Effects on Historic or Cultural Resources***
No cultural or historic resources are known to occur within the project area. FWP will commission a cultural inventory and will consult with the State Historic Preservation office before project implementation.

### 2.2.8 Summary Evaluation of Significance

| **13. Summary Evaluation of Significance** | **Impact** | | | | **Can Impact be Mitigated?** | **Comment Index** |
|---|---|---|---|---|---|---|
| Will the proposed action, considered as a whole: | **Unknown** | **None** | **Minor** | **Potentially Significant** | | |
| a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.) | | X | | | | |
| b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur? | | X | | | | |
| c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan? | | X | | | | |
| d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed? | | X | | | | |
| e. Generate substantial debate or controversy about the nature of the impacts that would be created? | X | | | | | 13e |
| f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e) | X | | | | | See 13e |
| g. List any federal or state permits required. | | | | | | 13g |

***Comment 13e: Generate Debate or Controversy***

The barrier construction and piscicide component of this project have potential to generate controversy or concern. During the public meeting component of a previous Yellowstone cutthroat trout action in Lower Deer Creek, several landowners voiced concern over the fish barrier, and the threats to neighboring property should the structure fail. FWP will hold a public meeting at which the design and structural engineers will explain design parameters and structural stability of the proposed barrier. As an added measure, DNRC's Dam Safety Program will review the designs, even though this structure is substantially smaller than dams they are required to review.

Piscicide projects can generate controversy from some people. The planned public meeting will include an outreach and education component on piscicide use in fisheries management, and the risks to human health and the environment, which are short-term and minor or nonexistent. The potential for controversy with this project is unknown.

***Comment 13g: Necessary Federal or State Permits***

This project would require several permits, which are as follows:

- DEQ 308 authorization – Authorization for short-term exemption of surface water quality standards for applying piscicide.
- DEQ 318 authorization – authorization for short-term exemption of surface water quality standards to address short-term increases in turbidity associated with construction.
- Montana Stream Protection Act (SPA 124 Permit) – permit for any agency or subdivision of federal, state, county or city government proposing a project that may affect the bed or banks of any stream in Montana.
- Montana Floodplain and Floodway Management Act – permits new construction within a designated floodplain.
- Federal Clean Water Act (404 permit) – permits activities that would result in the discharge or placement of dredged or fill material into waters of the United States.
- DNRC Land Use License - FWP has applied for this license.

# 3.0 ALTERNATIVES

Three alternatives received consideration during preparation of the environmental assessment. The proposed alternative (alternative 1) and no action (alternative 2) were evaluated in detail. One additional alternative was eliminated from full consideration, as it was more expensive, less feasible, and would have a low probability of meeting project objectives, namely achieving long-term persistence of Lower Deer Creek's pure Yellowstone cutthroat trout population.

## *3.1 Alternatives Given Detailed Study*

### 3.1.1 Alternative 1 (Preferred Alternative): Barrier construction, followed by removal of nonnative trout above the barrier, and reintroduction of pure Yellowstone cutthroat trout to Lower Deer Creek

The proposed action involves three components: construction of a concrete barrier, chemical removal of fish from above the barrier, and reintroduction of salvaged Yellowstone cutthroat trout and mottled sculpin to reclaimed waters. This alternative addresses the identified threats to Lower Deer Creek's Yellowstone cutthroat trout population, namely, invasion of rainbow trout hybrids from downstream, and sympatry with brown trout throughout the drainage. Nontarget aquatic organisms would experience short-term reductions in diversity and numbers, but would rebound in weeks to months. Wildlife species consuming fish would experience a short-term availability of dead fish, followed by short-term reductions in fish numbers, until the population rebounds. Predators on invertebrates of aquatic origin may experience short-term reductions in prey availability, although biomass will likely rebound quickly. The anticipated long-term outcomes would be complete restriction of fish movement at the barrier, and removal of brown trout and rainbow trout hybrids from Lower Deer Creek above the constructed barrier. The consequence of these outcomes would be a secured population of pure Yellowstone cutthroat trout with a high probability for long-term persistence.

### 3.1.2 Alternative 2: No action

Under the no action alternative, no measures would be taken to secure the existing Yellowstone cutthroat trout in Lower Deer Creek. The predicted consequence is continued introgression of rainbow trout genes into the population, which would result in a hybrid swarm, and loss of the pure population. Brown trout would continue to exert predate on, and compete with, Yellowstone cutthroat trout, and would likely displace the population within years to a few decades.

## *3.2 Alternatives Considered but not Given Detailed Study*

### 3.2.1 Alternative 3: Barrier Construction with Mechanical Removal of Nonnative Fishes

Under this alternative, barrier construction would occur, along with mechanical removal of brown trout and hybrids captured through electrofishing. The predicted consequence is that rainbow trout hybrids upstream of the barrier would spawn with Yellowstone cutthroat trout, resulting in the loss of the pure population. Brown trout would continue to be a threat, and would likely displace the hybridized population over time.

The difficulty in achieving 100% removal is a primary deficiency in using mechanical removal as an option. The level of effort associated with even incomplete removal can be substantial. For example, FWP mechanically removed brook trout (*Salvelinus fontanalis*) from a nearly four miles of Muskrat Creek (Shepard et al. 2001). During the four-year effort, fieldworkers captured nearly 5,400 brook trout and moved them below a constructed barrier. By the end of the project, brook trout were still present above the barrier, and treatment with piscicide became the recommended alternative. Other researchers found five removals were required for successful elimination of rainbow trout from a stream in Tennessee (Kulp and Moore 2000); however, the stream length in this study was about 0.5 miles. In comparison, the Lower Deer Creek project area is over 11 miles, in remote and rugged country.

In some cases, mechanical removal did not remove all nonnative fish; however, the native species benefited from reduced competition associated with this suppression. In a stream in Tennessee, electrofishing did not eliminate rainbow trout, although reduced numbers allowed brook trout to reestablish (Moore et al. 1983). Native cutthroat trout in a Wyoming stream displayed a similar response to mechanical removal of brook trout (Thompson and Rahel 1996). The positive response of native trout is likely temporary, as remaining nonnatives would eventually rebound and exert the same competitive pressures on native species.

In the case of Lower Deer Creek, incomplete removal of nonnatives would not result in attainment of project objectives. Notably, any remaining hybrids would spawn with Yellowstone cutthroat trout, which would mean the loss of the genetically pure population and creation of a hybrid swarm. Likewise, brown trout would continue to threaten the remaining Yellowstone cutthroat trout, and would likely displace the cutthroat entirely over time. East Fork Duck Creek in the nearby Crazy Mountains provides an example of the ability of brown trout to displace Yellowstone cutthroat trout within decades. Fisheries investigations in the 1980s found Yellowstone cutthroat trout substantially outnumbered brown trout (White 1984). In 2007, FWP sampled a portion of East Fork Duck Creek, and found a reversal in species dominance, with brown trout adults outnumbering Yellowstone cutthroat trout adults 15:1.

In summary, mechanical removal of nonnatives would not result in attainment of project objective, and would entail considerable expense. The likelihood of removing 100% of nonnatives along more than 11 miles of stream in this remote country is exceedingly low. Furthermore, mechanical removal would likely require the commitment of considerable time and resources to the project, and would extend the duration of the removal portion to a minimum of 4 to 5 years. Likewise, the remaining hybrids would continue to breed with the pure Yellowstone cutthroat trout, which would lead to loss of the genetically pure population. Brown trout numbers would likely rebound, and this species would continue to compete with and prey on Yellowstone cutthroat trout.

# 4.0 ENVIRONMENTAL ASSESSMENT CONCLUSION SECTION

## *4.1 Evaluation of Significance Criteria and Identification of the Need for an EIS*

Evaluation of the potential impacts on the physical and human environment in 2.0 ENVIRONMENTAL REVIEW provides the basis for determining the need for an environmental impact statement (EIS), which is a more rigorous evaluation of the potential impacts to human health and the environment from the proposed action. If evaluation of these significance criteria suggests the proposed action would result in significant impacts, an EIS would be required.

This environmental review demonstrates the impacts of the proposed project are not significant. The proposed actions would benefit native Yellowstone cutthroat trout in Lower Deer Creek with minimal effects on the physical, biological, or human environment.

## *4.2 Level of Public Involvement*

Several factors influence the appropriate level of public involvement for a given proposed action. Risks to human health, the environment, local economics, as well as the seriousness of the environmental issues are key considerations. This project will include a 30-day public comment period. The public will be informed of the potential project through press releases in local newspapers and through a notice on FWP's website (http://fwp.mt.gov/news/default.aspx). A public meeting will be held on August 4, 2010 at the Carnegie Public Library in Big Timber, Montana (314 McLeod Street) at 6:00 pm.

## *4.3 Public Comments*

The public comment period will extend from July 15, 2010 to August 13, 2010.

Send comments to:

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